Brandon
Research Station
1886-1986

Agriculture Canada
1886·1986
RESEARCH·RECHERCHES

Cover photograph
Pioneer homestead.

Photograph on the title page
W.H. Johnston is credited with developing more barley varieties than anyone else in Canada. His work at the Brandon Experimental Farm led to the release of nine different varieties.

Brandon
Research Station
1886 · 1986

Sharon Ramsay

Research Branch
Agriculture Canada

Historical Series No. 31
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One hundred years of progress

The year 1986 is the centennial of the Research Branch, Agriculture Canada.

On 2 June 1886, *The Experimental Farm Station Act* received Royal Assent. The passage of this legislation marked the creation of the first five experimental farms located at Nappan, Nova Scotia; Ottawa, Ontario; Brandon, Manitoba; Indian Head, Saskatchewan (then called the North-West Territories); and Agassiz, British Columbia. From this beginning has grown the current system of over forty research establishments that stretch from St. John's West, Newfoundland, to Saanichton, British Columbia.

The original experimental farms were established to serve the farming community and assist the Canadian agricultural industry during its early development. Today, the Research Branch continues to search for new technology that will ensure the development and maintenance of a competitive agri-food industry.

Research programs focus on soil management, crop and animal productivity, protection and resource utilization, biotechnology, and food processing and quality.

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...Whoever could make two ears of corn, or two blades of grass, to grow upon a spot of ground where only one grew before, would deserve better of mankind, and do more essential service to his country, than the whole race of politicians put together.

Jonathon Swift—*Gulliver's Travels: Voyage to Brobdingnag*, 1726

Foreword

This history describes 100 years of research and development at the Agriculture Canada Research Station, Brandon, Man. These activities were intimately intertwined with the growth and development of the agricultural industry in the area served by this station. The Brandon Experimental Farm was among the original five farms established under the auspices of the *Experimental Farm Stations Act* of 1886. Land and other resources were acquired in 1887 and operations began in 1888 under the direction of the first superintendent, S.A. Bedford.

This history is organized by subject. Each topic is traced from its initiation to its termination or to the present day, as appropriate. This approach, rather than a chronological one, was chosen so that the whole story on each topic could be told in one section. New subjects for experimentation were usually addressed through the appointment of new research officers with the expertise needed to pursue specific avenues of work. Each topic initiated was a response to a current production problem or an investigation of a potential new opportunity.

Readers will note how the types of work conducted at the station changed over time. In the early years the experimental farm served the diverse needs of an infant industry. Technologies from elsewhere were tested for suitability in the prairie environment. Seed of superior crop varieties and stock of superior animal breeds were distributed to farmers. These activities had dramatic effects on productivity. As agriculture developed at the farm level, so did the services we provided to agriculture. A provincial extension service was established with a mandate for education and technology transfer. Transportation and communication services were so improved that the extensive network of illustration stations and project farms could be eliminated. The production sector of agriculture became more specialized, other experimental farms were established, and a capability for agricultural research and development expanded at universities. Accordingly, the focus of activities at the experimental farm were shifted from testing and demonstrating to research and development. With our orientation redirected at solving more complex production problems, a need for more specialized talent, better laboratories, and concentration on a smaller number of problem areas became evident. This change in direction led to the reclassification of the Brandon Experimental Farm to the Brandon Research Station. The emphasis of programs then shifted to beef, swine, barley, corn, forage crops, and soil management.

The accounts of the work conducted over time focus on the research scientists, biologists, and other principal investigators involved. As with most historical writings, events are thus identified with the generals and colonels, while the sergeants and privates remain anonymous. The achievements obtained at the station, though, were made possible only through the dedicated and diligent efforts of hundreds of plot workers, technicians, office staff, animal attendants, farm operations staff, summer students, and other part-time support staff. This history is a tribute to their collective efforts.

This publication was made possible through the efforts of many present and former staff members, who provided varying amounts of input. Special recognition is due Sharon Ramsay, however, who took on the difficult task of producing this history while continuing with her other duties as information officer.

Agricultural research is a venture-capital activity. Investments are made in risky areas in the hope of making discoveries that provide a high payoff to the investor. This history describes many such discoveries. The beneficiaries of this public investment in research are not only the producers, who are the primary clients; but also Canadian and foreign consumers, who benefit from a productive and efficient agricultural industry through a safe, nutritious, reliable, and relatively low-cost food supply. Research will continue—through our next 100 years—to solve production problems in agriculture and identify new opportunities for the benefit of all Canadians.

B H Sonntag

B.H. Sonntag
Director
Research Station
Brandon, Man.

December 1985

CHAPTER 1
Shaping the station

The pioneer period of western agriculture

The development of agriculture in western Canada traces back to two events of significance in the mid 1800s: the decline of the fur trade in the Northwest Territories and the subsequent transfer of land holdings from the Hudson's Bay Company to the Government of Canada. There was a need to determine an alternative potential for this vast region. Settlement was moving swiftly through the Great Plains of the United States, and Canadian entrepreneurs observed Yankee expansion with envy. They felt that the tractless wilderness west of Upper Canada and the Great Shield must hold equal economic opportunities to those of the American West. The expansion of Canada into the Northwest Territories was to be the stepping stone to nationhood for this British colony.

Prairie settlement was seen as a chance to increase Canada's base of trade, business, and economics. Politicians and merchants back East seemed anxious to expand the marketplace for their manufactured goods as well as to develop the area for settlers. The opening of the West would be in the name of progress and was conceived to be a benefit for the whole British Empire. In 1855, a Toronto expansionist and son of a prominent Upper Canada politician, Alexander Morris, published a pamphlet in which he stated:

The time has come when the claims of humanity and the interests of the British Empire require that all the portions of this vast empire which are adapted for settlement should be laid open to the industrious immigrant.

The Canadian expansionist movement came into prominence for another reason. Many feared the growing power of the United States. As long as the great western plains remained virtually empty, American designs on territories north of the 49th parallel were a definite threat.

Far-sighted individuals in eastern Canada began to raise questions about the agricultural potential of the Northwest, and they were making optimistic estimates about the value of the land and the prevailing climate. In 1857, an expedition was mounted under the auspices of the Government of Upper Canada to survey the northwestern frontier. This group was directed by a professor of geology from Trinity College in Toronto, Henry Youle Hind. Also, in 1857, the British government sent a party headed by Captain John Palliser to conduct a scientific exploration of the territories. It is unfortunate that the area was not first evaluated through the eyes of future homesteaders who would transform the grassland into productive farms. There were no trained botanists on either mission. Consequently, the reports they brought back were rather ambiguous toward agricultural settlement. While they dismissed a large portion of the region, they were confident that some areas would sustain profitable farming. Up to this time, the first priority of the Hudson's Bay Company had been to maintain the prairie for fur traders and buffalo hunters.

Palliser and Hind reshaped the 19th-century vision of the Northwest Territories. They did away with the previous generalizations about endless wilderness and reassembled the region into areas of identifiable soil and climatic conditions relative to their agricultural potential. The explorers defined a fertile belt sweeping in an arc from the Red River northwest to the forks of the Saskatchewan River and from there south to the Rocky Mountains. Below that belt they reported a vast area of more arid grassland, which was thought to be an extension of the Great American Desert and has since become known as the Palliser Triangle. This triangle was judged unfit for agriculture.

By this time, the first handful of prairie settlers had survived and prospered on the banks of the Red River for several decades. Their existence was obvious proof that an agricultural population could be supported in both social and economic terms. The results at the Red River settlement showed that people could make a success of farming in the Northwest. In the imagination of eastern Canada, this settlement was now seen as the eastern boundary for a vast network of farm communities that would open up the country. When the *Rupert's Land Act* was passed in 1870, jurisdiction over the Northwest Territories was transferred from the Hudson's Bay Company to Canada. The government immediately embarked on a policy to attract settlers.

Immigration into the newly annexed territories was promoted through descriptions of prosperous farmers living amidst fields of golden grain; maps were distributed showing the routes of "projected" railways extending across the land. Needless to say, these promises were unduly embellished. A pamphlet, "Information for Intending Emigrants," was published by the Canadian government in 1873. It claimed that land in the West was so rich that fertilizer was not necessary. The soil was "inexhaustable." In his 1877 publication entitled *A Practical Hand-Book and Guide to Manitoba and the North West*, Alexander Begg stated:

The almost total absence of fog or mist, the brilliancy of the sunlight, the pleasing succession of the seasons, all combine to make Manitoba a climate of unrivalled salubrity, and the home of a healthy, prosperous and joyous people.

By 1880, the Canadian Pacific Railway had mapped out its southern route for transcontinental train service in accordance with changes in public opinion about the Northwest. This new view held that all of the western plains and not just the northerly "fertile belt" were readily adaptable to agriculture. The southern route, in fact, presented fewer construction problems across the prairie than a northern line did. Furthermore, it would create an effective barrier to possible American encroachment into the empty Canadian West. From that time, the new wave of settlement began to move into areas that the railway now serviced. The community of Brandon, Man., decided to incorporate as a city in 1882. This status was felt to be more in keeping with Brandon's role as a major railway center in the prairie region.

Settlers from eastern Canada and from countries overseas soon found that agriculture in this new land varied from what they had known. The conditions of soil and climate were completely different. The need for action on behalf of agriculture in Canada was realized by the Dominion Parliament. The House of Commons named a select committee on 30 January 1884 to enquire into the best means of developing and encouraging suitable farm practices for both the new and the more established areas of Canada.

A system of experimental farms already existed in England, Germany, France, and the United States. The Select Committee prepared and sent a questionnaire out to some 1500 farmers, teachers, and businessmen throughout Canada. One of the questions read:

Would the establishment of an experimental farm or garden where varieties of foreign grain, fruits, trees and fertilizers might be tested; and whence such seeds, plants, etc., might be distributed throughout the Dominion be advisable?

above
Harvest crew at work with teams and thresher.

below
Threshing gang.

The response was overwhelmingly favorable, and the committee members recommended the establishment of such farms in their report of 21 March 1884. In November 1885, the Honorable John Carling, then Minister of Agriculture, instructed Professor William Saunders of the University of Western Ontario at London to visit the United States for the purpose of reviewing the experimental stations in that country. Professor Saunders had established himself as a reputable botanist, entomologist, horticulturist, and businessman; he was an ideal candidate for the job.

Professor Saunders submitted his report to Sir John Carling on 29 February 1886. This report was, in turn, presented as a bill before Parliament on 15 April. Two weeks later, the Minister of Agriculture moved that the House of Commons go into committee to consider the legislation. *An Act Respecting Experimental Farm Stations* was passed by Parliament on 12 May 1886 and received Royal Assent on 2 June. It authorized the establishment of five experimental farms.

One site was acquired immediately to serve the regions of Ontario and Quebec from the national capital, Ottawa. It was designated as the Central Experimental Farm. The other four sites were selected in 1887. Nappan, N.S., was chosen for the Maritime Provinces. It is much to the credit of Canadian parliamentarians of the time that they had the foresight to locate three of these experimental farms in the West, where the need for introducing and testing new farm practices was most urgent. Operations commenced in 1888 at Brandon, Man.; Indian Head, Northwest Territories (Saskatchewan); and Agassiz, B.C.

Establishment of the Brandon Experimental Farm

After Confederation in 1867, vast areas of virgin land opened up for agricultural settlement. Pioneers soon found that farming in the West was very different from what they were accustomed to in eastern Canada and abroad. The settlers knew little about the seasons, climatic conditions, soil types, and natural vegetation of the central plains. In recognition of this great need for information, a permanent department was created for direct government action in agricultural experimentation. The act that organized the Department of Agriculture received Royal Assent on 22 May 1868.

The experimental farms established in 1886 were given the mandate to carry out experiments and investigations in animal production, dairying, field husbandry, horticulture, and entomology. Crop varieties, livestock breeds, and farm practices would be tested, and the results from this work were then to be published in news bulletins for general distribution. Each experimental farm would serve as an information center for farmers of the region. For this reason, the sites had to be chosen carefully.

The first director of the Experimental Farms Service, Professor William Saunders, made two visits to Manitoba in order to secure a suitable location for an experimental farm in the new province (established in 1870). He was accompanied by Spencer Argyle Bedford and Angus MacKay, who would soon become the first superintendents of the experimental farms at Brandon and Indian Head, respectively. In his 1888 report on the experimental farm's establishment, Professor Saunders outlined three criteria that the area should meet: "a variety of soils, a sufficient supply of water of good quality, and a site within convenient reach of the railway." Various towns, individuals, and government agencies lobbied vigorously for political support. One of the sites under consideration by the Government of Canada was Brandon.

In 1793, the first Hudson's Bay Company trading post was built on the banks of the Assiniboine River under the stewardship of Factor "Mad" Donald McKay. Brandon House was situated several miles east of the present city limits. It would be the first of three Brandon houses or forts established. These trading posts were in the fur business, but by 1832, the depletion of pelts brought an end to viable operations. However, Brandon House was a regular stopping place for traders and travelers who passed through. As well as being on the banks of a much used waterway for the fur trade, the site was also near a popular overland route across the prairie called the Yellowquill Trail. The boundaries of the province of Manitoba expanded from postage-stamp size in 1881 to include the community of Brandon.

The same year the railway arrived, the limits of the settlement were clearly defined. Brandon was officially incorporated as a city on 30 May 1882. In June of 1881, the entire population numbered about 100 people. Three hotels had been established. One year later, the city boasted 3000 residents and 21 hotels in response to the demands for accommodation from the new settlers. This population figure remained fairly constant, and about 3500 people lived in Brandon at the time of the experimental farm's establishment.

The city was served by not only a railway but also an overland route. Its populace even enjoyed regular steamship service on the Assiniboine River, both east to Winnipeg as well as to the Northwest Territories. The steamship service was an important factor that contributed to the development of this region and the settlement of Brandon. During the townsite's formative years, from 1879 to 1885, riverboats transported freight and passengers into the area in the spring and summer. However, competition from the faster and more economical railway eventually spelled the demise of steamship service and ended this period in Brandon's history.

Brandon Research Station, 1985.

In presenting its case for an experimental farm, local pressure from Brandon was organized and effective. J.G. Hughes, the acting mayor, wrote to the Minister of Agriculture, Sir John Carling, on behalf of the City Council in January of 1887. In April, the Brandon Board of Trade also sent a petition with the same request, namely, that their location be chosen for the experimental farm. These communications from the citizens of Brandon were taken seriously by the politicians in Ottawa. The Dominion government would approve the purchase of 652 acres (264 ha) within the city limits later that year. The Land Titles Office recorded transactions with Catherine Stewart for W 27-10-19 W1 ($4800) on 28 July 1888; with Frank W. Peters for SE 27-10-19 W1 ($733.60) on 6 August 1888; and with John William Stewart for E 28-10-19 W1 ($5700) on 14 July 1891, among others. The property would include 1764 acres (714 ha) as of 1985. The work of road building and fencing was begun in 1887. The local newspaper, the *Brandon Weekly Mail*, reported on a call for tenders in 1888 to build houses for the superintendent, the farm manager, and the horticulturist.

Professor Saunders detailed the many reasons for this choice in his 1888 report on the establishment of the Brandon Experimental Farm:

The advantages of this site are many. It has a large area of soil which fairly represents the great grain-growing districts of Manitoba. The sheltered ravines in the bluffs represent to some extent the bluff country. It has every variety of soil needed for experimental purposes, and an abundant and never-failing supply of good spring water... It is very central for the larger number of farmers settled along the main line of the Canadian Pacific Railway... The farm is in full view of the passing trains so that all travellers and settlers passing through can see it, and being but 1 ½ miles from the business centre of Brandon, it is within walking distance of that city.

The experimental farm was well placed at Brandon. There are a variety of soils within the area of the farm. As it is situated on the bank of the Assiniboine River, it contains a deep, rich, black loam with a clay subsoil at the bottom of the Assiniboine Valley. One portion has the heavy clay that is typical of eastern parts of the province and another has a lighter loam with sand like the western areas of Manitoba. Up the slope of the valley on the higher level, there is rolling prairie where the soil is shallow and sandy. Thus, most soil types in the agriculturally viable regions of Manitoba are represented within this one section of land.

Spencer Argyle Bedford was appointed superintendent of the new experimental farm in 1888, and he held this responsibility until 1905. He was succeeded by N. Wolverton in 1906–1907, then by J. Murray in 1907–1911, W.C. McKillican in 1911–1925, M.J. Tinline in 1925–1946, R.M. Hopper in 1946–1960, and J.E. (Ed) Andrews in 1960–1965. When the focus of experimental farm operations shifted from simple testing and demonstration to research and development aimed at solving more complex production problems, the farm was reclassified as a research station in 1966. W.N. (Norm) MacNaughton acted as its first director from 1966 to 1980. He was followed by B.H. (Bernie) Sonntag in 1980 to the present.

S.A. Bedford, LLD
Superintendent
1888–1905

N. Wolverton, BA
Superintendent
1906–1907

J. Murray, BSA
Superintendent
1907–1911

W.C. McKillican, BSA
Superintendent
1911–1925

M.J. Tinline, BSA
Superintendent
1925–1946

R.M. Hopper, BSA, MSc
Superintendent
1946–1960

J.E. Andrews, BSA, MS, PhD
Superintendent
1960–1965

W.N. MacNaughton
BSc, MSc, PhD
Director
1966–1980

B.H. Sonntag, BSA, MSc, PhD
Director
1980 to the present

The very first efforts of Superintendent Bedford were to make the site attractive, as well as to conduct agricultural experimentation. The old trail meandering through the fields to the farm buildings on the upper bank of the valley was replaced with a graveled roadway set out in a straight line and planted on either side with Manitoba maples. Other strategically planned shelterbelts of maple, hazel, and oak were planted. Some investigatory work began on fruit trees for their beauty, as well as their practicality. The Brandon Experimental Farm was to be an example for all new settlers to follow.

left

Oat harvest at the Brandon Experimental Farm, 1890.

opposite page

A poultry barn was erected in 1917

In 1889, the first full year of operation for the farm, Superintendent Bedford had planted over 400 varieties of trees, grains, grasses, flowers, and vegetables for trial. The farm also acquired cattle, sheep, swine, and poultry to test and demonstrate new breeds and management practices. As well, there were horses both for demonstration and for the considerable work that was performed. In that year, a permanent staff of 12 men was hired. This number increased to 20 during the peak labor season in summer.

The five newly established experimental farms had the mandate of obtaining seed varieties from Europe and Asia for testing in Canada. With this in mind, the Minister of Agriculture entered into a correspondence with the Government of India in order to select and acquire grains suitable for experimentation and possible cultivation in the country. In this matter, Canada had a friend in the Viceroy of India, the Marquis of Dufferin.

During the years 1872 to 1878, Lord Dufferin had been the Governor-General of Canada. While in this post, he had traveled widely, visiting British Columbia on one occasion and Manitoba twice. This was no mean accomplishment, considering that the trips were made before the transcontinental railway was built. In 1877, Lord Dufferin paid special visits to the immigrant settlements in the Red River Valley and along the shores of Lake Winnipeg. He was quite concerned that these farm commmunities should thrive and eventually open the entire prairie region for agricultural settlement. Ten years later, while he was Viceroy of India, this concern for Canada's future translated itself into action on behalf of the new Experimental Farms Service. In the 1888 report of the Dominion Experimental Farms, the following action took place at his request:

The governments of the North-Western Provinces and the Punjab have been asked to instruct the directors of agricultural departments in their respective provinces to obtain a supply of seeds of grain to be forwarded to Canada... It is proposed to try the Indian seeds in Manitoba and the plains of the north-west.

The *Brandon Weekly Mail* commented on these and other similar shipments to Superintendent Bedford in its edition of 11 April 1889. The article reported that "the number of grain samples being received daily by Mr. Bedford of the experimental farm gives the interior of the post office the appearance of a granary."

The primary concern of the new director and superintendents of the Experimental Farms Service was that Canadian farmers would be made to realize that agriculture was a science. Therefore, farm practices should be based on the results of carefully considered observations and experiments. The experimental farms were to perform this research and then relay the information to farmers across the nation. At the end of 1888, a reporter from the *Brandon Weekly Mail* visited the experimental farm. In his article of 20 December entitled "The Agricultural Farm: All in a Flourishing Condition," he stated:

The great advantage of the farm to the country will be this: that a record of every test will be preserved and published, so that the people of Manitoba who have neither the means nor the time to spend in experiments themselves may have access to the most skillful experiments of the most practical men without a cent of cost to anyone.

This astute reporter of 1888 captured the essence of the Brandon Experimental Farm's mandate, and the statement of purpose is as valid today as it was a century ago.

Construction activities

With the establishment of the experimental farm at Brandon, it was necessary to erect permanent structures to accommodate the staff and research activities that were the farm's mandate. There were two unfinished buildings, a barn and a frame house measuring 20 ft × 26 ft (6.1 m × 7.9 m), on the property when it was purchased. One of the first tasks of Superintendent Bedford was to oversee the completion of these two buildings. By the end of 1888, two temporary implement sheds were also erected.

A bank barn, measuring 50 ft × 111 ft (15.2 m × 33.8 m), was built in 1889. The 10-ft-high (3.0-m) stone basement contained stalls for the farm's 40 head of cattle and 12 horses. Two silos, each 9 ft × 9 ft (2.7 m × 2.7 m), were constructed beside the new barn. From the bottom of the basement the silos extended 11 ft (3.4 m) above the floor of the barn's upper storey. The superintendent's residence was also finished in this year, permitting the other house on the property to be used for employee accommodations.

In 1892, a poultry barn measuring 16 ft × 32 ft (4.9 m × 9.8 m) was built. Also that year, the farm installed a windmill on the roof of the cattle barn to pump water, grind grain, and cut hay and straw. In 1893, a two-storey implement and carriage shed was built. The top storey was used for cleaning and storing grain; the main floor, for storing carriages and displaying produce from the experimental farm. A new barn measuring 24 ft × 40 ft (7.3 m × 12.2 m) was built in 1895 to accommodate the swine program. The piggery was divided into sow pens, each 10 ft × 10 ft (3.0 m × 3.0 m). It had a 4-ft (1.2-m) passage with gutters on each side for liquid manure. From the barn, seven pens were fenced off for outside lots, four to the south for sows and three to the north for boars. In 1897, a driving shed was constructed for the storage of vehicles. It was built on similar lines as the present-day pole barns for livestock.

One of the major construction events of 1897 was the building of a bridge across a small lake on experimental farm property. This body of water has since become known as Lake Percy. Previously, access to the lower fields along the riverbank had been by a pontoon bridge, and the old bridge had become unsafe for horses and machinery.

After the turn of the century, the building design at Brandon was representative of the eastern, or Ontario, style. Many of these structures are still standing. They are an illustration of the architecture of the time and a tribute to the craftmanship of the day. The experimental farm was fast becoming known throughout the region as the showplace it was intended to be. The superintendent's report of 1905 states that 18 000 visitors toured the farm that year.

A new stave silo with a capacity for 175 tons (158.7 t) of silage was built in 1909 on the north side of the barn. Its entrance opened into the middle of the stable. In 1913, a new piggery was constructed. This building remained in use until 1970 and was finally demolished in 1983. A horse barn, two storeys high, was erected in 1914. The loft was used to store hay and straw. The main structure consisted of 14 single stalls and 3 box stalls. The next year was very busy in terms of construction. A root cellar, measuring 30 ft × 40 ft (9.2 m × 12.2 m), was built on the north side of the cattle barn. A new concrete silo was put up. This silo, 16 ft (4.9 m) in diameter and 34 ft (10.4 m) high, is still standing in excellent repair. The work with poultry was accommodated by the construction of colony houses and an administration building. The basement of this building was utilized for egg storage and incubation. All this new space must have been utilized to the maximum, because the annual reports for these years indicate that the only winter storage area available for the farm's bee colonies was the basement of the superintendent's residence.

On 6 December 1916 a fire destroyed the cattle barn, horse barn, and implement shed, along with a substantial amount of feed and equipment. After the clean up, workers found that the first 10 ft (3 m) of the cattle barn's walls had escaped destruction from the blaze. Poles were laid across the width of the building and covered with straw in order to house the animals over the winter.

The following 2 years were very busy times for the Brandon Experimental Farm. A new cattle barn, horse barn, and general-utility shed were built to replace those lost in the fire. As well, a new sheep shed, implement shed, horticultural building, and poultry barn with a housing capacity for 100 hens were added to the collection of buildings already at Brandon. Late in 1918, a new house was constructed to replace the superintendent's old residence. Another house for the experimental farm's gardener was built in 1919. The cattle barn that was built to replace the one burnt down is still standing in excellent condition. At present, it is being used to house a chemical room, carpentry shop, and work area for drying and processing forage and cereal samples. The loft provides additional storage space. The horse barn was in use at the experimental farm until 1968, when it was demolished. Some of the building materials were taken away to be reused at a nearby Hutterite colony. Part of the utility shed built in 1918 is still in use. Hidden under new siding, it is now the farm manager's office and has washrooms and a lunchroom for the farm crew. The gardener's house has

recently undergone extensive renovations. In accordance with the tradition established in 1919, it is now, once again, the residence of the gardener on staff.

In 1922, the first of several trench silos was built. Their use proved quite satisfactory, and trench silos are a part of present-day operations at the research station. Also around that time, more staff homes were built at the farm. These houses have been in use since 1924 and have only recently been scheduled for demolition.

The first greenhouse was built in 1932, and it is still operational. Over the years, this greenhouse has seen the development of many new plant varieties. It is now being used to grow the flowers and plants that beautify the ornamental gardens at the research station.

The bee house, as it became commonly known, was built in 1935. It housed the work done in bee research on the farm for many years until the program ended in 1969. At that time, the building was remodeled. It now serves as the office and laboratory for meats research.

The building of a farrowing barn and a new house for the farm's superintendent occurred in 1947. The farrowing barn has since been renovated into offices and laboratories for metabolism work in the swine program. The superintendent's house is the residence of the director now at Brandon.

Major construction of a new office and laboratory complex took place in 1950. The old office building was moved to the western edge of the property for staff living quarters. The new structure was built on the original site and is still being used. The 1950s saw quite a lot of new construction, reflecting the change of focus from experimental farm to research station. A second office and laboratory complex or header house was constructed in 1957. In 1958, a greenhouse was added to this building to facilitate further work in plant and soil science. Another greenhouse was added the next year.

A new implement shed was built to house large and small plot equipment. The field crops building, still in use today, was erected in 1951. As well, three buildings were constructed for the poultry program. These were a laying house, brooder house, and poultry nutrition building. Since the research station no longer conducts any poultry research, the buildings have been converted into a general storage shed, an

opposite page • above

This barn was used for a sheep-wintering experiment in 1917.

opposite page • below

The cattle barn, destroyed by fire in 1916, was rebuilt and is still standing in excellent repair.

above

The main office of the Brandon Research Station as it appears today.

below

A 150-sow gestation barn was completed in 1983.

isolation barn for the swine herd, and a feedmill and office complex for the senior swine herder. The large poultry laying house built in 1957 has been remodeled into a grower barn for market hogs. The brooder house built in 1958 has now been turned into a modern farrowing facility. In fact, all of the buildings originally constructed for poultry research have been renovated to accommodate swine research. In 1959, the first modern research piggery was constructed, complete with climate-controlled heating and ventilation as well as a gutter cleaner to remove manure from the building.

A large barn was moved to the experimental farm from the Indian Residential School in 1958 to serve an expanded program in beef cattle. It was to be used as a calving barn. A large pole structure was set up for winter housing. The pole barn had a concrete floor to facilitate cleaning. This was a marked improvement over the other existing structures. A hay shed was also erected that year. In 1962, a heifer test pole barn was built. Two trench silos and a new slatted floor barn were constructed in 1967, and two shed-type pole barns were put up in 1969. Two more hay sheds were built for the increase in feed requirements.

With the start of the foreign cattle breed evaluation project, new corrals were seen as a necessity. The scope of the project would require more handling of the animals. This corral system has since been improved with a shelter for the cattle squeeze and weigh scales to make the job of data collection easier in the winter. Other modifications have taken place to accommodate larger numbers of cattle and increased handling necessary to collect ultrasonic data, blood samples, and skeletal frame measurements. Specially modified chutes with a tip table for small calves have been added. Most of these changes have improved the use of time and manpower at Brandon. In 1971, further construction in the cattle unit occurred during a winter works program. A calving barn, a bull barn, and another pole shed were built onto the existing facilities. As well, modifications to the header house provided more space for growth chambers and laboratories.

A larger trench silo was constructed in 1973 to provide space for the additional corn silage needed. In 1975–1976, a wintering facility was built for the cow herd. This facility consists of 20 equal-sized pens with cement feeder bunks and a 2.75-m-high fence to shelter the animals from the wind and snow.

All the conversions of poultry housing to swine facilities were completed by 1981. In 1980, boar pens were constructed, and a 150-sow gestation barn was completed in 1983.

Modifications to buildings are always necessary to meet the needs of changing research programs. Maintenance of buildings is constant and ongoing. Constraints do occur, and work is scheduled subject to budgetary cuts, availability of manpower, and weather conditions. Most of the buildings on the research station are in acceptable condition. There is always a need for upkeep, repairs, and improvements. All in all, the facilities are maintained to serve the research activities.

CHAPTER 2
Animal research

Bees

The very first report of honey bees kept at an experimental farm in Canada was in 1889 at Brandon, Man. Two colonies of Italian honey bees were purchased locally by Superintendent Bedford. These were tended by Bedford personally and were overwintered in his basement. With the capture of natural swarms, the apiary increased in size. Observations were made on prevailing climatic conditions, as well as on the foraging activities of the bees and various methods for overwintering the colonies.

In May 1896, two additional colonies of Italian honey bees were received from M.B. Holmes of Athens, Ont. These were reputed to be gentler and better honey producers. The experimental work compared bee colonies for their foraging ability, productivity, and winter survival. As good crops of honey were obtained, the number of colonies in the apiary grew.

Bedford was a meticulous observer and was keenly interested in beekeeping. He promoted this facet of agriculture throughout the province. As a result of his interest and leadership, Manitoba beekeepers elected him as the first president of the Manitoba Beekeepers' Association at its founding session in 1903.

During the first 2 decades of this century, the Brandon apiary provided a large number of swarms to interested farmers in the province. As a result, optimum honey production declined at the experimental farm. In some years, colonies had to be fed syrup from either cane or beet sugar before being overwintered in the cellar. Successful storage in this manner demanded proper management of the colonies. When preparation was inadequate or overlooked, such as in 1906–1907, only 5 out of 15 colonies survived. The 1909–1910 results on overwintering were even more disastrous, when only 1 out of 15 colonies came out alive. However, if adequately fed, as in 1914–1915, all 26 colonies placed in winter quarters survived the long confinement. Outdoor wintering of colonies in quadruple-insulated cases was tried the following year with satisfactory results. Before 1916, bee colonies were always overwintered in cellars, as it was thought that bees could not possibly survive the extremely cold conditions on the prairies.

Meanwhile, appointments were being made in Ottawa that would have a direct bearing on the Brandon apiary. The Central Experimental Farm obtained its first bees in 1893 with the purchase of 10 colonies. In 1910, C.G. Hewitt became Dominion entomologist. He recognized the vast possibilities for honey production and pollination, as well as the economic importance of beekeeping in Canada. Hewitt recommended that an experienced beekeeper be engaged to supervise all bee investigations in the country. As a result, F.W.L. Sladen, a beekeeper from England, came to Canada in 1912 as apiarist in charge. One of the first things that Sladen did was to visit and organize beekeeping on the experimental farms. At that time, bees were kept at Brandon (since 1889), Indian Head (1896), Agassiz (1896), and Nappan (1897). At his suggestion and encouragement, apiaries were established at 12 other experimental farms during the next 8 years. Sladen, then 45 years old, suffered a fatal heart seizure on 10 September 1921 while working in a queen-mating yard on Duck Island. His assistant, C.B. (Charles) Gooderham, was appointed Dominion apiarist later that year.

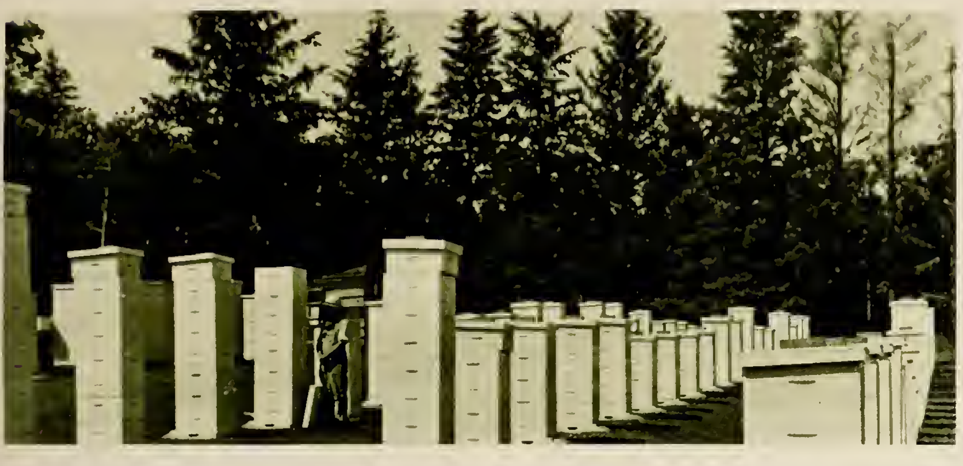
Great expansion in Canadian beekeeping took place during Gooderham's term in office. In 1921, Canada produced less than 5 million lb (2 million kg) of honey. However, by 1948, a record of over 45 million lb (20 million kg) was produced annually. Much of the interest in beekeeping during the 1920s and 1930s was due to Gooderham himself. He was a prodigious writer and popular speaker. Because of his enthusiasm, beekeeping became very popular; some 45 000 beekeepers were registered in 1946, whereas there are only 21 000 today. Gooderham encouraged the experimental farms to expand into apiculture and directed most of the beekeeping investigations from Ottawa. As a result, bees were kept at 21 experimental farms across the country in 1924. By 1966, however, only four research stations continued to maintain apiaries, and today, bees are kept at only one research station, in Beaverlodge, Alta. This record of achievement since the 1920s illustrates the significant progress made by the industry through long-term research and development in apiculture.

In the late 1920s, the entire Brandon apiary was moved to the Morden Experimental Farm because bees were needed there for pollination of certain horticultural crops. Furthermore, no one at Brandon was interested in conducting experiments with honey bees. At Morden, E. (Erdman) Braun, a young horticulturist, was assigned the responsibility for the apiary.

Most of the Morden apiary, which consisted of more than 100 colonies, was transferred back to Brandon in 1934. Too many bees were being killed at Morden each spring when it was necessary to spray fruit trees with arsenicals. This practice ruined many bee experiments. Braun, who had done such a fine job of building up the apiary, was also transferred to Brandon as apiarist and horticulturist. In 1935, J.E. (John) Geiger was hired to assist in the apiary.

Braun and Geiger maintained records on weather data and blooming periods of local flora. They conducted numerous projects, including studies on honey flow; different sizes of hive equipment; different sizes of package bees; bee longevity; overwintered versus package bees; the performance of different races of bees; queen rearing; causes of supersedure of queens in package bees; availability of local nectar-secreting and pollen-shedding plants and their attractiveness to bees; upper versus lower entrances for wintering colonies; use of various compounds to sterilize combs infected with the disease American foulbrood; various qualities and locations of stores for wintering; overwintering bees outside in insulated cases; cellar wintering of colonies indoors in single versus double brood chambers; and estimation of honey flow by weighing the colonies on an hourly basis. Many of these experiments were cooperative endeavors with those of other experimental farms, coordinated by the Dominion apiarist in Ottawa. When Gooderham retired in 1949, C.A. Jamieson, a recent graduate, was put in charge.

In 1950, Jamieson requested the transfer of Braun to Ottawa as senior apiculturist, because he desperately needed a person with practical and technical knowledge. The Manitoba Beekeepers' Association, as well as the Manitoba Cooperative Honey Producers Ltd., strenuously objected to Braun's transfer since he was their technical director; but all to no avail. From 1951 till 1955, Geiger continued the various bee experiments as outlined by Braun from Ottawa. In November 1956, Braun died of a heart attack.



above
The Brandon Experimental Farm apiary in 1944.

center
Preparing hives for the winter.

below
H. Turnbull, extracting honey in 1962.

In April 1956, J.C.M. (Maurice) L'Arrivée was appointed apiculturist at the Brandon Experimental Farm. L'Arrivée was no stranger to the Brandon apiary. He had worked there as a student assistant under Braun and Geiger during the summers of 1949 and 1950. With the assistance of Geiger, L'Arrivée conducted numerous experiments in pollination (alfalfa and sunflowers), bee diseases (American foulbrood and nosema), bee management (wintering methods), and bee breeding.

The attractiveness of nectar- and pollen-producing plants to honey bees was measured for several years. Attempts to redirect foraging bees to alfalfa and sunflowers produced nonsignificant increases in pollination, owing to competitive floral sources that had higher sucrose contents or greater volumes of nectar.

Investigations into *Nosema apis*, a protozoan parasite of bees, resulted in the development of uniform sampling techniques that became universally accepted by bee researchers. The effect of *Nosema* on colony productivity was also measured. For each dosage of spores fed to the colonies, there was a corresponding decrease in honey yield. About 25% of queen bees were found to have some inherent tolerance to nosematosis, which extended their lifespan and provided a source of infection to worker bees.

Over a period of 5 years, 18 different insulating materials were evaluated in the development of a long-lasting, easily applied, low-cost insulating wrap for colonies to be overwintered outdoors. One, the so-called Brandon Pack, consisting of 75 mm of fiber glass encased in plastic, gave consistently better results when colonies were provided with adequate top ventilation.

Behavioral bee genetics had its debut at the Brandon Experimental Farm in 1960 when, for the first time in Canada, queen bees were artificially inseminated. Highly inbred lines selected for specific traits were developed. One of these traits was pollen-collecting propensity. Two inbred lines, one for low pollen-collection and storage and the other for high pollen-collection, were obtained. Whereas the former had to be fed pollen substitute to maintain brood production, the latter had its frames so clogged with pollen that the pollen-bound combs had to be removed and bees were fed sugar syrup to supplement colony stores.

In the fall of 1965, L'Arrivée was transferred to Ottawa despite the strong objections of the Brandon Area Beekeepers' Association. He resigned 2 years later, terminating his career as an apiculturist.

Geiger closed down all beekeeping operations at the Brandon Research Station just prior to his retirement in 1969. This action followed instructions from Ottawa. Geiger died in Kelowna, B.C., in 1983 after serving many years as a local bee inspector. Thus ended an important chapter in the research activities at Brandon, one which contributed so much to agriculture in Manitoba.

Cattle

Four breeds of purebred cattle and some grades were represented at the Brandon Experimental Farm between 1890 and 1894. The Galloway was a beef animal. Holstein and Ayrshire were popular for dairying, and the Durham (Shorthorn) was recognized as a dual-purpose breed raised for both meat and milk. Another beef breed, the Angus, was added in 1895.

The first reported work with cattle was in 1892 when the herd numbered 15 head. The aim of this work was described as an effort to measure the adaptability of different breeds to Manitoba conditions.

Steer feeding Steer feeding on an experimental basis began in 1892 and continued for the next 30 years. The objectives were twofold: to develop a method of utilizing homegrown feeds, particularly those for which there was a limited market, and to establish a supplementary source of income by feeding cattle over the winter months when other farm operations were slack.

In the 1st year, the experimental farm conducted a feeding trial to assess the value of frozen wheat and barley. In subsequent years, the work covered evaluation of all the commonly grown farm feeds: appraisal of inside versus outside feeding, as well as feeding in loose stalls versus tie stalls; examination of the effects of dehorning; and comparison of steers of different ages and grades.

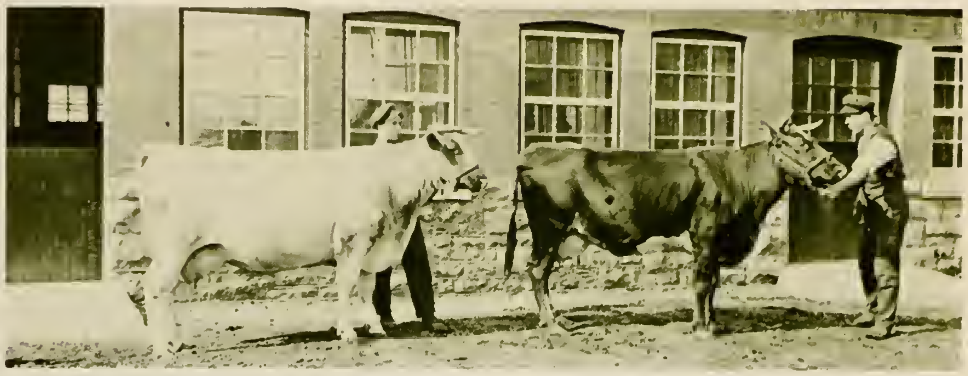
These experiments provided a good deal of useful information on steer feeding, and the practice expanded rapidly throughout the province. Farmers would purchase feeders in the fall when ranchers were selling their annual produce and prices were low, feed them during winter, and market them in the spring when prices for finished cattle were high. In most years, steer feeding proved to be a profitable venture.

Dual-purpose shorthorns By 1910, the herd was mainly Durham (Shorthorn). Studies were being conducted in both beef and dairy husbandry. A keen interest had developed in dual-purpose breeds capable of producing calves with satisfactory beef type and conformation, as well as good yields of milk and butterfat to supply family needs. Surplus milk and milk products represented a ready source of income, either through sales to commercial dairies or as fluid milk, cream, butter, and cheese to local community markets.

In response to this growing interest by farmers, a herd of dual-purpose Shorthorns was established in 1911. Superior cows from the Brandon herd were retained, and 20 head were moved from the Central Experimental Farm in Ottawa. In 1920, three additional cows were transferred to the herd from Indian Head, Sask., and three were purchased in eastern Canada in 1922. No other introduction of females occurred, and when dual-purpose breeding was discontinued in 1944, there were six female family lines in the herd. Three families originated from the Ottawa introduction, two came from the original herd at the Brandon Experimental Farm, and one traced back to a cow transferred from the experimental farm at Indian Head.

The objective was to develop a high-performance herd of milking Shorthorns that could also produce calves with suitable beef type and conformation. Line breeding (via the selection of herd sires) to cows with superior milk production and the culling of inferior individuals were practiced to increase yields of milk and butterfat in the herd. Culling was also used to maintain beef type and conformation. Moderate success was achieved. Some pertinent results are listed below.

- Shorthorn bulls with two or more generations of high-producing females in their ancestry were scarce in Canada, and some of those available were inferior in beef type and conformation.
- Of 18 sires used, some produced daughters with greater milk yields than their dams, some improved beef type in their offspring, and some failed to affect either meat or milk production. In no case was there improvement in both beef type and milk production.
- The average milk production in the herd was essentially the same in 1944 as it had been in 1911 when the herd was established. The highest yields of milk were recorded in 1934, when the herd average was 7568 lb (3436 kg). Three cows exceeded 10 000 lb (4540 kg) of milk, and one of them produced 14 000 lb (6356 kg).
- Milk production and beef type appeared to be antagonistic characteristics, and attempts to improve them simultaneously were unsuccessful.
- Contrary to the proposed plan, breeding was effected through a series of outcrosses because of the limited availability of bulls with an ancestry of high milk production.



opposite page

Winter management of cattle in the early years.

above

Shorthorn milk cows in front of the cattle barn in 1920.

below

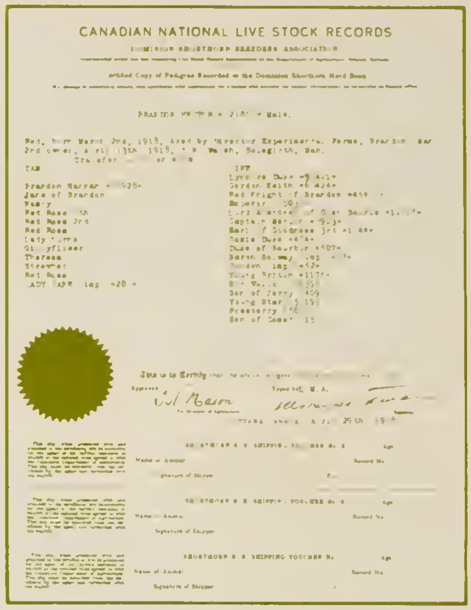
Three Brandon heifers at a Clydesdale–Shorthorn field day on 16 June 1938.

- Over the years of dual-purpose breeding, more than 300 young Shorthorn bulls were sold to farmers in western Canada (primarily Manitoba). These animals were all of suitable beef type and had a good background of milk production. Information on their performance was obtained by means of visits and questionnaires to farmers, and they indicated general satisfaction. Reliable experimental data were lacking. However, there was little doubt that these bulls actually improved the milk production of grade cows in small farm herds.

Although the emphasis in breeding Shorthorns had been on milk production, the herd was used periodically for a variety of related studies in nutrition, management, and disease control. Most locally grown crops were evaluated as cattle feed, the suitability of many crops for silage production was studied, silos and other methods of storage were investigated, and procedures for identifying reactors to contagious abortion and tuberculosis (TB) were studied in cooperation with the Health of Animals Division, Department of Agriculture. Testing for contagious abortion was started in 1927 and continued annually for 38 years. Testing for TB also took place annually, and a fully accredited Bang's-free herd was maintained.

Beef-cattle breeding In 1941, the Shorthorn herd was split into two groups. One group was kept at Brandon, where it continued to be managed as a milking herd in which beef type was a major consideration for the selection of herd sires. The other group was moved to the Reclamation Substation at Melita, where it was used as a beef herd in grazing and other studies associated with forage production. Proper management of pasture and stock was one of many strategies developed for the reclamation of light soils that had been ravaged by wind erosion.

At both locations, herd sires were selected for good beef type and conformation to improve the meat production characteristics of the various family lines. With the decision to discontinue dual-purpose breeding in 1944, studies were initiated to evaluate herd sires on the basis of growth and performance of their offspring. Initially, limited numbers of calves were individually fed on a standard test ration. As the facilities improved, it became possible to individually feed complete progeny groups of both heifers and bull calves. These trials began in 1952. Other tests were carried out to analyze individual


CANADIAN NATIONAL LIVE STOCK RECORDS

Brandon Shorthorn bulls were sold to local farmers to improve performance in their herds.

growth patterns for calves, body measurements at specific stages of development, individual feed utilization data, the effect of age of dam on individual growth and development, and the reproductive performance of heifers and bulls when used as breeding animals at 1 year of age. Much of the data obtained in these studies formed the basis for the national record of performance (ROP) testing program for beef cattle, which was adopted in 1957.

A large-scale selection project based on performance was launched the same year under the project leadership of W.N. (Norm) MacNaughton at Brandon. More than 500 cows of similar breeding background were assigned to the project. They made up the Shorthorn herds at Brandon and Melita, in Manitoba; Indian Head and Scott, in Saskatchewan; and Lacombe, in Alberta. Selected and control lines of foundation cows were established at each location. The Brandon–Melita–Indian Head component was viewed as one closed herd replicate; the Lacombe–Scott component was considered a second. These components were eventually consolidated at Brandon and Lacombe, respectively. The major objective of the study was to determine the effectiveness of selection based on performance testing and the relative importance of genetic and nongenetic factors in the growth of beef cattle.

In the fall of 1960, MacNaughton relinquished his duties as project leader to become superintendent of the experimental farm at Melfort, Sask. H.T. (Howard) Fredeen at Lacombe succeeded as project leader, and in 1961, G.W. (Gunther) Rahnefeld was appointed to the staff and given major responsibility for the project at Brandon.

This was the largest controlled program for beef-cattle selection ever undertaken in the world. It utilized a Shorthorn population in excess of 500 breeding females and attracted international attention. Over a 14-year period, 1957–1972, the selection program achieved an annual increase in yearling weight of bulls in the order of 10 kg. Approximately 45%, or 4.5 kg, of the gain resulted from genetic change. This work provided the first clear evidence of the efficiency of consistent performance selection with beef cattle.

The Shorthorn selection project was suspended in 1970 when the herd and facilities were required for other breeding studies. The Shorthorn herd was used to produce crosses for the evaluation of new (exotic) beef breeds being imported from Europe. Prior to 1950, the only beef cattle recognized in Canada were the British breeds: Hereford, Angus, and Shorthorn. The Charolais breed came to this country from the United States in the early 1950s, thanks to the efforts of several enterprising Canadians. Strict animal health regulations had prevented direct importation from Europe. Commercial cattlemen were impressed with the outstanding growth potential and carcass merit of Charolais crosses. They began to switch their allegiance from the traditional breeds, and pressure mounted to facilitate the introduction of foreign cattle.

above

Group of steers of dual-purpose Shorthorns, exhibited in 1936.

below

Harvest of fodder beets (*Beta vulgaris*) for cattle feed.

The late Senator Harry Hays, then Minister of Agriculture for Canada, responded to this pressure in 1964 by establishing quarantine facilities and rigorous health inspection procedures for cattle entering Canada. Two years later, the director of the Lacombe Research Station was commissioned to visit Europe in order to evaluate breeds for their beef potential under Canadian conditions. J.G. (Jack) Stothart chose typical breeding stock of the best breeds for importation by the department. He selected representatives of the Simmental breed for Lacombe in 1967. Brandon was allocated six bulls and four heifers of the Limousin breed in 1968 and another eight heifers a year later. The first importation arrived after clearing quarantine in April 1969.

A large-scale cooperative program was developed at Brandon and Lacombe to evaluate Limousin-sired, Simmental-sired, and Charolais-sired top crosses out of representative herds of Hereford, Angus, and Shorthorn cows. Research activities would focus on productivity factors like ease of calving, preweaning growth, feedlot performance, and carcass merit. The Lethbridge Research Station and its Onefour Substation near Manyberries later joined in the project. Over a 3-year period, 1969–1971, Rahnefeld and R.L. (Robert) Cliplef entered into contracts with 18 producers in Manitoba, Saskatchewan, and Alberta for the production of the crossbreds. J.A. (Jack) Newman at Lacombe made similar arrangements with 20 producers in Alberta to produce corresponding Simmental and Charolais crosses. The nine types of exotic × domestic crossbred (F_1) heifers would be compared for their lifetime reproductive performance in the contrasting environments of Brandon and Manyberries, Alta. J.E. (John) Lawson of Lethbridge arranged for the purchase of 150 Hereford × Angus heifers to serve as a control population (i.e., the 10th type under evaluation). The project was officially launched at Brandon in June 1970 with the transfer of yearling F_1 females to Manyberries and the arrival of yearling F_1 females from Lacombe. A herd of 1150 females, equally distributed between Brandon and Manyberries, was assembled over 3 years. The first progeny of those females were calved in the spring of 1971. In preparation for the buildup at Brandon, the Shorthorn herd was transferred to Lacombe in 1970 and the Limousin breeding herd followed in 1971.

The committee responsible for this cooperative research was chaired by Fredeen from Lacombe and comprised Lawson from Lethbridge; Rahnefeld from Brandon; and Newman, G.M. (Milton) Weiss, and A.H. (Archie) Martin from Lacombe. Brandon and Manyberries maintained and managed the F_1 cow herds. Lacombe developed the data bank and evaluated the feedlot performance of calves produced at Manyberries. All calves produced were three-way crosses. For the heifer production year, hybrid females were sired by Red Angus and Beefmaster bulls; for subsequent calf crops, they were sired by Charolais, Chianina, Limousin, and Simmental bulls.

Designated as the foreign cattle breed evaluation (FCBE) project, it developed as four interrelated phases. Phase I involved the production of F_1 progeny, the females for comparison of lifetime reproduction and the males for evaluation of feedlot performance and carcass yield and quality. Phase II dealt with the central issue of reproductive efficiency of F_1 females under breeding herd management practices that were characteristic of the two diverse environments at Brandon (intensive pasture production) and Lethbridge (extensive management on the semiarid rangeland of Manyberries).

The foreign cattle breeds used to produce the F_1 females differed in their genetic potential for lactation. The anticipation that a Simmental × Shorthorn cross would provide the most milk was verified by the dam-cross differences in the weaning weights of calves. However, this productivity was accompanied by prolonged anestrus and reduced conception rates. The reduction was particularly severe under the harsh environment at Manyberries. A direct consequence was increased culling for reproductive failure. The interplay of genetic and environmental stresses led to distinct differences in net lifetime productivity of the 10 crosses under evaluation.

These results clearly demonstrated that hybrid vigor is not a panacea for beef producers in western Canada. Genetic, including heterotic, superiority in the reproductive potential of beef cattle can, in fact, be detrimental to lifetime productivity if it is not matched with environmental conditions or management practices that are adequate to sustain the biological demands imposed by that potential.

Some insight into this problem has been provided by the results of Phase III. Phase III involved confinement of the cow herds at both locations during winter gestation and summer lactation to secure information on breed cross differences in their maintenance requirements. Feed inputs were measured against the weight of calves weaned by each of the 10 different types of F_1 cows. Milk production was monitored for quantity and quality. The cows were regularly checked for weight changes and probed for backfat.

Subcutaneous fat represents insulation as well as an important energy source for the brood cow. Experience at the Onefour Substation near Manyberries indicated that cows carrying less than 5 mm of fat when weaned in October did poorly during the winter and had substandard conception rates the following summer. Except for the Hereford × Angus cows, which averaged 8–9 mm of fat at weaning time, all nursing cows of the other crosses at Manyberries ranged from 0 to 5 mm of fat in the fall. To restore them to an acceptable level of fatness for winter required feed inputs, for at least part of the winter period, of as much as 30–40% higher than those standards recommended by the National Research Council of Canada.

Phase IV was designed to evaluate the reproductive performance of cows produced by backcrossing the F_1 females to sires of their parental breeds. In Phase II, some of the large and heavy-milking first-cross cows did not rebreed if they were unable to consume sufficient forage under the adverse grazing conditions at Manyberries. Perhaps a one-quarter exotic × three-quarters British cow would still promote superior growth rate in its calf but have fewer fertility problems. Would a three-quarters exotic × one-quarter British cow excel over a one-half exotic × one-half British cow under the better pasture conditions at Brandon? Phase IV is an attempt to answer these questions, and work will not be completed until 1987. However, new research plans have already been implemented to use the progeny of F_1 cows with outstanding lifetime performance for detailed studies of the inheritance of individual traits that contribute to reproductive performance.

This account of the various cattle programs at Brandon cannot come to an end without acknowledging the meaningful contributions of the beef herd managers over the years: A. (Alex) Kelman, 1928–1965; G. (George) Watt, 1965–1967; W.J.P. (Percy) Chegwyn, 1967–1971; and B.W. (Barry) Foote, 1971 to the present.

above

Part of the herd in the foreign cattle breed evaluation project.

opposite page

Colony Belle at 13 years of age

Horses

Horses were extremely important to the pioneer farmer, and they continued to be the main source of power on farms in western Canada well into the 1930s until the advent of gasoline tractors.

Horses were first brought to the Brandon Experimental Farm in 1888. They consisted of nine heavy draft horses with grade Clydesdale and Percheron breeding and three lighter horses. All were used exclusively for transport and general farm work.

In the fall of 1914, the first registered horses arrived at Brandon. Two purebred Clydesdale mares were purchased from a Manitoba breeder as good representative specimens of the breed. A new horse stable with effective ventilation had been built earlier that year to better accommodate additional horses.

No breeding or experimental work was done until 1915. However, records were kept on the number of working hours and type of labor, as well as the amount and cost of feed to maintain each horse.

A project in the breeding of Clydesdale horses was conducted at Brandon from 1915 to 1953. The experimental farm maintained an outstanding herd of Clydesdale mares. One such mare, called Colony Peggy, would go on to win several championships at the Provincial Exhibition of Manitoba in Brandon. Highly prized stallions were kept to serve these mares. Farmers and local breeders were also able to deliver their mares to the stud for breeding. In 1920, the experimental farm became a member of the North Brandon Horse Breeders' Club, a local organization of farmers who hired a stallion each year. A cooperative horse-breeding plan, known as the Premium Mare Policy, was in operation at Brandon from 1935 to 1944. Four imported Clydesdale stallions were at stud for the community during that 10-year period. A Percheron stallion was also maintained and usually stood for service each season at two or three locations in Manitoba.

The Clydesdale horses at Brandon performed much of the general farm work. However, they were also used in a limited way for experimental feeding or management trials. Upon the request of the Manitoba Horse Breeders' Association, the experimental farm conducted a project to develop techniques for artificial insemination in horses from 1945 to 1947. Each year a student with the Ontario Veterinary College was employed as a technician to draw the semen, conduct any necessary examination or tests on viability of the sperm, and prepare it for storage. Farmers who had nominated mares for the program would advise the technician when a mare was in season. The technician would then drive to the owner's farm and carry out the insemination. Problems of collecting, preserving, and transporting the stallion semen appeared more difficult than they were with bovine semen. Only limited success could be claimed for the project; of 178 Clydesdale and 175 Percheron mares inseminated, a mere 15.2% and 17.1%, respectively, proved to be in foal.

The horse-breeding project was discontinued in 1953, and horses were removed from the experimental farm's inventory in 1962.

Poultry

The need for farmers to produce meat and eggs economically led to the establishment of a poultry flock at the Brandon Experimental Farm in 1893. The first report on work with poultry discussed the construction of a poultry house, measuring 16 ft × 32 ft (4.9 m × 9.8 m), where the bricks were placed in mortar between the studs. Small numbers of three breeds of chickens—Barred Plymouth Rock, White Leghorn, and Light Brahma—were obtained. Winter production under cold weather conditions was practically nonexistent, but summer production for Barred Plymouth Rocks and White Leghorns was quite satisfactory. The large-combed White Leghorns were considered unacceptable because the severe winter weather caused their combs to freeze. As a result, egg production dropped and the salvage value of the carcass was poor. The Minorca, White Wyandotte, Buff Orpington, and White Plymouth Rock breeds of chickens were tested over the next few years. Poor winter production, egg eating, and soft-shelled eggs were major problems. Egg eating was overcome by building nests with false bottoms so that the eggs rolled out of reach of the laying hens. This type of nest remained in use for many years. The occurrence of soft-shelled eggs was combatted with considerable success by mixing ground fresh bone into the ration. By 1903, it was decided that Barred Plymouth Rock and White Wyandotte were superior to the other breeds of fowl, because of their good meat characteristics and reasonable egg production.

A large amount of poultry meat was being imported into Manitoba before the turn of the century. In 1895, studies were undertaken to see if turkeys could be produced here profitably. Both turkeys and chickens proved to be plumper and heavier when raised in confinement. Turkeys weighed over 10 lb (4.5 kg) when penned, but they were less than 8 lb (3.6 kg) when allowed to run at large. Ducks were also maintained on the farm for 1 year, but they did not prove satisfactory for meat production.

For a number of years, broody hens were used to hatch eggs. The difficulty in having broody hens available when needed presented serious problems, so a small incubator was purchased in 1903. By 1913, it was decided that greater effort should be put into poultry research. Four new poultry houses, measuring 10 ft × 12 ft (3.0 m × 3.7 m), were built. Each had a single board floor and cotton front. Trap nests were provided in order to identify individual laying performance. This would allow for the selection of superior females based on reproduction. Since there were facilities for only 100 laying hens, the decision was made to concentrate on two breeds: Barred Plymouth Rock and White Wyandotte. Two new incubators were purchased at this time.

In 1916, W.H. Hicks was hired to take responsibility for both poultry and bee research. Previously, S.A. Bedford and N. Wolverton, the first two superintendents at Brandon, had undertaken this work. A poultry administration building was constructed. A brooder facility with a cotton front was being used for baby chicks; blankets with boards around each brooder improved conditions inside the building. Hot-air and hot-water incubators were compared. The hot-air type gave better results. The four poultry houses on the farm were modified to study various types of housing that would provide satisfactory conditions for laying eggs in the winter. Results over several years showed that the buildings needed to be double-boarded at least. Pullets were also found to be more economical than hens for winter egg production.

Facilities were again expanded in 1920. A new laying house was built, with a front that was one-third wood, one-third glass, and one-third cotton. The ceiling was slatted and covered with 2 ft (0.6 m) of straw. The slats provided good air circulation. The glass in the mid-third of the front prevented drafts at floor level and produced more pleasant conditions for the hens. This laying house with 20 pens accommodated the Manitoba egg-laying contest, which began in 1919 and continued until 1936. The contests were initiated to stimulate poultry production in the area, as well as to permit registration of birds that met particular standards of breed and laying performance. Initially, the birds had to produce 150 eggs over a 50-week period. There were special certificates for those laying over 200 eggs. Competitors sent in samples of 10 pullets. These samples were housed in individual pens to enable identification of stock from each producer. The tests established that there was really no best breed. However, the strain within a breed was important.

The experimental farm began a pedigree breeding study with Barred Plymouth Rocks in 1922. The birds were trap-nested to assess individual egg production. Only the layers with the best performance records were used to produce the following generation of chicks. Results of the annual Manitoba egg-laying contest indicated that the program did indeed improve egg production. The Brandon pullets were at the head of this contest each time. To upgrade poultry production in the area, the experimental farm began selling hatching eggs, as well as supplying good cockerels and surplus pullets to interested farmers.

During the 1920s, new guidelines were set for the poultry program. Research would focus on genetic improvement of the flock at Brandon. Head poultry manager W. Watkins undertook this work and other studies in nutrition, incubation, and marketing. He conducted many experiments, for example, comparing diets for fattening cockerels and examining methods of storing eggs. Eggs could be stored 4–6 months and remain edible, providing they were placed with the large end up. Hull-less oats, corn, and other kinds of protein were tested in an attempt to increase egg production. Watkins also evaluated the use of electric lights during the morning to lengthen daylight hours.

In 1926, R.M. Hopper arrived as the officer in charge of all livestock research, including poultry. When he was later appointed farm superintendent from 1946 to 1960, W.N. (Norm) MacNaughton assumed these responsibilities in 1948. During the time that poultry was part of the livestock program, the head poultry manager played an important role in the research undertaken. In 1928, P. (Phil) Hammonds took over from Watkins in this position and held it for the next 37 years. He continued the breeding study that emphasized individual performance of the laying stock. Hammonds also developed a means of pedigreeing the birds. Each layer could be identified by a unique wing band throughout its lifetime. Feeding trials were undertaken in which buttermilk, beef scraps, alfalfa, and cod-liver oil in the diets of laying birds were compared. Cod-liver oil improved hatchability and fertility, but it increased egg production only marginally.

When the Manitoba egg-laying contest ended in 1936, more facilities became available for research. The size of the poultry flock at the experimental farm was increased the next year to 200 breeding hens, 500 pullets, and 50–100 breeding males. The hatchery had a 500-egg capacity. More than 100 000 chicks were sold to interested farmers from 1937 to 1946. This practice was discontinued in 1947 with the advent of commercial hatcheries. However, the impact of Brandon's egg and chick

sales cannot be overemphasized. The distribution of superior stock had a marked effect upon the production of both eggs and poultry meat at the farm level.

Blood testing for pullorum was carried out first in 1929 and annually thereafter. During the first 3 years, up to 14% of the flock tested positive for this disease. The removal of reactors decreased chick mortality and improved hatchability. By 1947, the disease was eradicated for all practical purposes.

The poultry-breeding study evolved into a more comprehensive project in 1932, and it continued through the 1940s. Numerous feeding trials were also conducted. Either millet or barley was found suitable in amounts comprising 50% of a balanced ration. There was little difference in feeding durum wheat or common spring wheat. Furthermore, low-grade feed wheat proved just as satisfactory as high-grade spring wheat. Diets containing 60–80% grain and 20–40% mash promoted efficient egg production. Crate feeding was better than pen feeding to fatten cockerels. In diets for meat birds, oats were superior to barley.

In 1952, G.S. Lindblad joined the staff at Brandon. He was a poultry nutritionist on loan from the Central Experimental Farm in Ottawa. Coincident with this move was the decision to administer the poultry program separately from all other work with livestock. The breeding phase of the program would be terminated, and research activities were to be redirected into nutrition. The poultry-breeding project, which involved 20 years of progeny testing with Barred Plymouth Rocks, had increased the average laying performance of hens from less than 150 eggs a bird in 1932 to 209 eggs. However, all of this increase could not be credited to the breeding program alone. Improvements in both nutrition and management contributed to it as well. To accommodate the new emphasis on nutrition, a laboratory was constructed. It was equipped with individual egg-laying cages, battery brooders for chicks, and several incubators.

E.J.D. (Elmer) Walter replaced Lindblad as poultry nutritionist in 1953 when he returned to Ottawa. Walter set up several nutrition studies that would generate important results over the next 5 years. The experiments with laying hens used White Leghorns, which were the prominent breed in the egg-laying industry. Commercially produced chicks were provided for work with broilers. Walter proved that the practice of feeding insoluble grit to laying hens was not a necessity. All-mash diets increased the efficiency of egg production over diets of mash and grain. A great deal of research was conducted to determine the nutrient requirements of baby chicks. Walter found that female chicks needed less calcium than males did. There were differences in tolerance to the dietary level of barley. Response to growth factors in dry whey powder and brewer's yeast occurred only when vitamin B_{12} was added. Sunflower oilseed meal was not satisfactory as the only source of protein supplement in either layer or chick-starter rations. However, a combination of sunflower and soybean oilseed meals proved superior to meat and fish meals. Walter also looked at protein energy relationships in diets for broilers and laying birds.

During the 1940s and 1950s, tremendous changes took place in the poultry industry. Small farm flocks were fast disappearing. Eggs and poultry meat found in the grocery stores were supplied entirely by commercial operations, which raised the birds in total confinement. Nearly all the chicks that were marketed through hatcheries were strain crosses. Breeding of both broiler and egg-laying flocks was being concentrated in the hands of a few entrepreneurs. Broiler producers chose the Cornish breed for the makeup of their strains. Leghorns were used almost exclusively for egg laying.

Poultry barn, 1951.

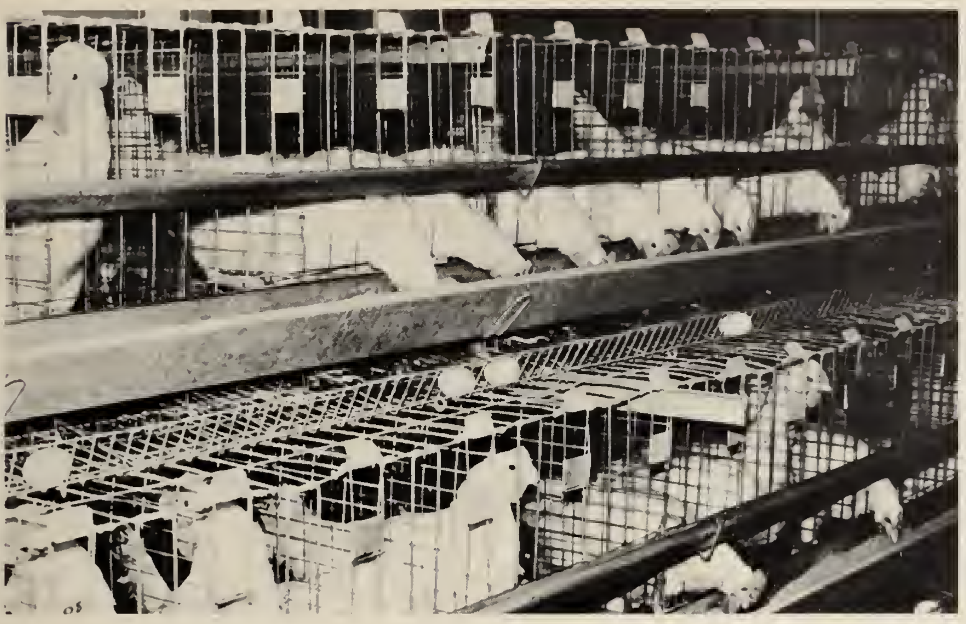
Egg grading, 1968.

The research requirements of the industry were also changing. Large commercial firms began to carry on some of the development work necessary to meet their needs. The Department of Agriculture responded by concentrating its research efforts. Several of the small poultry units across the country were closed. Others became larger. In Manitoba, research on poultry came to an end at the Morden Experimental Farm. Its genetic work was transferred to an expanded program at Brandon that would encompass nutrition and breeding. Studies in genetics, discontinued in 1952, were to resume at the Brandon Experimental Farm in 1957. The transfer was made in such a way that no interruption would occur in the Canada-wide cooperative breeding project, which was designed to determine the feasibility of selection for egg production in White Leghorns based on progeny testing. It was the first attempt ever made to use a control strain in poultry breeding to separate genetic improvement from the effects of environment. In addition, there were experiments on various levels of feed restriction during the rearing period from 8 to 21 weeks of age. This practice caused considerable controversy at the time, but it later became accepted management for both broilers and laying stock. When restricted groups received up to 70% of the amount consumed by full-fed groups, egg production improved with respect to number, size, and economic returns.

In 1960, Walter and the nutrition work were moved to Lethbridge, Alta. J.H. (John) Strain, who had been transferred from the Morden Experimental Farm, concentrated on work in genetics, breeding, and management. Since genetic studies would require large populations to give meaningful results, the housing capacity was again increased. Additional laying cages were installed. Brandon followed the industry practice of raising birds in confinement. Predator control was too difficult for range rearing. Until new poultry facilities could be built, the pole barns for feeding cattle were used for chickens during the summer when they were empty. Rearing large numbers of birds together caused problems with feather picking and cannibalism. One of the attractions for visitors to the experimental farm was the appearance of 5000–10 000 birds, each wearing spectacles. The use of spectacles successfully overcame these problems.

Facilities at Indian Head, Sask., were used as an extension of the Brandon program for several years. When the poultry unit there closed in 1968, A.P. (Alex) Piloski, G.F. (George) Ashmore, and a laborer were transferred to Brandon. Piloski took up a position as research officer and Ashmore became assistant poultry manager. The job of head poultry manager had gone to R.A. (Robert) Barwood in 1965 when Hammonds retired after nearly 4 decades of service. Barwood would become assistant farm manager when poultry research at Brandon came to an end in 1975.

A new selection project was started in 1962 to study the response to family index selection for laying performance of White Leghorns under two environments. Correlated responses between all important production and quality traits were other major aspects of the project. Under one environment, the birds were raised on full feed throughout their lifetime; under the other, they were restricted to 70% of full feed during the rearing period. Selection was based on the rate of egg production to 273 days of age, and the response differed under the two environments. After 12 years of selection, birds from the two strains performed equally well when reared on full feed. However, when feed restriction was imposed on the rearing environment, the birds selected under restricted feeding surpassed those under full feeding. The restricted-fed strain showed a slight increase in egg size and a delay in age at sexual maturity. As well, when the birds were under stress in the laying house, the restricted-fed strain performed better than the full-fed strain.



Laying hens in cages, 1968.

Other studies included estimating the effect of heterosis by measuring various components of income. It was found that heterosis resulting from selected strain crosses increased egg production and net economic returns. However, it had little effect on egg weight, feed efficiency, and several lesser traits. Heterosis was accentuated under high-fiber diets. In another experiment, six commercial strains of Leghorns were raised in cages or housed intermingled and separately in floor pens. The birds in cages reached sexual maturity sooner and laid more eggs in the early part of the testing period but less in later stages than the floor birds did. While interior egg quality was better with caged birds, shell quality was better with floor birds. The six strains ranked the same in floor pens. However, the superior strains on the floor were not necessarily the best in cages.

Cages became the predominant type of housing for laying hens. Since birds in cages were better producers if they came from individuals selected in a caged environment, artificial insemination was soon to be an integral part of poultry operations that produced hatching eggs. Maintenance of cockerels proved costly, and any system that would reduce the number of males required would be beneficial. At Brandon, roosters were found to produce 83% more sperm over a 2-month period if they were ejaculated daily rather than every other day (as was normally practised). There were no harmful effects on either the participating males or the sperm they produced. When females were inseminated at 5- or 7-day intervals, maximum fertility was maintained. However, an interval of 9 days caused a 15% reduction in fertility. Dosage as small as 0.004 mL proved satisfactory.

By 1971, the broiler industry had become very competitive. Unfortunately, large increases in the cost of inputs (such as soybean oilseed meal) began to threaten broiler breeding operations. In an attempt to improve this cost–price relationship, the Brandon Research Station entered into a project with the Peel Broiler Breeders of Ontario. They would examine the use of a simple recessive dwarfing gene in the production of broiler eggs. There was no difference in laying performance between half-sib normal and dwarf females. However, feed consumption was reduced by almost one-third. This result decreased the cost of producing hatching eggs considerably. When the dwarf females were mated to normal males, their offspring gave good results although they took slightly longer to reach market weight than normal broiler chicks did. Various methods of management were tried on the dwarf broiler females. Severe restriction of feed during the rearing period and regulated feed consumption in the laying house were necessary for an acceptable level of egg production. Preliminary data on the dwarf gene in broiler production looked promising, but more research and promotion would be needed.

During the same period, cooperative work was undertaken to develop an easy method of measuring the feed quality of different cereal varieties without using large amounts of grain. In one project with the Winnipeg Research Station, flour beetles and chicks were found to give similar results in testing several varieties of wheat and barley as feed. This information led to the use of the flour beetle by cereal breeders at Winnipeg in evaluating small samples of their grain for feed quality.

By the mid 1970s, commercial breeders had assumed responsibility for a great deal of research conducted by their own group of well-trained scientists. The Department of Agriculture maintained a large program in poultry genetics in Ottawa. Up to that time, very little effort was going into swine research in Canada. Therefore, the decision was made to terminate poultry research at Brandon. Its facilities, staff, and resources would then be redirected into swine breeding, management, nutrition, reproduction, and meat physiology. In accordance with this decision, poultry studies at the Brandon Research Station ceased in 1975.

Sheep

A small flock of grade sheep was added to the livestock on the experimental farm in 1911. The stated objectives were to determine the value of sheep in utilizing light land unsuitable for grain production and to conduct a limited number of nutrition experiments. Initially, investigators tried to find ways of disposing of farm by-products, such as wheat screenings, badly weathered alfalfa and grass hay, straw, and frozen turnips.

The sheep needed considerable upgrading in both meat and wool production. Purebred rams of the Suffolk, Oxford, and Shropshire breeds were compared for this purpose. The use of purebred Suffolks increased the number and weight of lambs in the fall, but Shropshires gave the best results for fleece production.

Several feeding trials were carried out with both lambs and ewes. Early marketing of lambs increased economic returns by shortening the nursing period and thus giving the ewe an opportunity to become better conditioned before the next breeding season.

Because pasture was scarce and expenditures had to be curtailed during the Depression, the flock was sold in 1931. This action ended a 20-year period of sheep research at Brandon.

Swine

The early years: 1891–1919 The first record of work with swine was in 1891 when the Brandon Experimental Farm undertook experiments in feeding pigs with frozen wheat and barley. Initial results of 4-month feeding trials with Berkshire grades were reported in 1893. These studies concluded that the value of frozen grain was increased by feeding it to pigs.

A piggery measuring 24 ft × 40 ft (7.3 m × 12.2 m) and containing seven pens as well as a feed room was constructed in 1895 to accommodate further work. At this time, the objectives were to test the value of home-grown feeds and to assess the suitability of various breeds for the climate. A breeding herd was established with the purchase of young boar-and-gilt pairs that represented three breeds—Berkshire, Improved Yorkshire, and Tamworth—available from Ontario. The Yorkshires were subsequently replaced by Chester Whites during 1897–1898. Breed evaluation was of secondary importance, since the emphasis was on feeding studies in the period up to 1906.

The scale of these early experiments was small, occasionally involving only two pigs per treatment, but the range of investigations was extensive. By the turn of the century, the use of several cereals, bran, and pease [sic] had been explored. The place of pasture in pig feeding was also being evaluated. Considerable attention was paid to the economic aspects; conclusions were often based on the feed cost per 100 lb (45.4 kg) of liveweight gain and the relative profitability of the various treatments.

Studies in the early 1900s included evaluation of some less-typical ingredients, such as lamb's-quarter weed seeds, potatoes, and turnips. A need for changes in the management of brood sows was also revealed; animals confined over the winter months were found to be prone to producing unthrifty litters.

In 1906, a long-term experiment with the Berkshire, Tamworth, and Yorkshire breeds was proposed. The aims were to evaluate the potential of crossbreds and to establish accurate information on the total costs and returns from pig production. The emphasis continued to be on feeding rather than breeding studies. However, the presence of breeding stock at the experimental farm was advantageous to private farmers, who made regular purchases of the offspring to improve their own herds.

The variety of ingredients under evaluation soon increased. Results from feeding experiments were communicated to farmers with some degree of caution, because premature release of information could prove disastrous.

The use of pasture or standing crops as an inexpensive feed source for pigs during the summer was investigated for many years, but there was a growing interest in the feed requirements of pigs under confinement. A 1911 report from Brandon discussed results of an experiment to evaluate digester tankage as feed; it consisted of dried animal residues produced by the meat-packing industry. The data revealed certain benefits from adding this type of animal-protein supplement to grain-based diets. Root crops, such as mangels, also had a place in such rations. A root cellar was accordingly included in the new piggery erected in 1913. Measuring 32 ft × 82 ft (9.8 m × 25.0 m), the facility contained 14 pens, each 10 ft × 12 ft (3.0 m × 3.7 m). It allowed the number and scope of feeding trials to be expanded. However, the effects of World War I were soon to become evident.

The cost of feed needed to produce a 1-year-old gilt increased from $9.68 in 1915 to $29.74 in 1918. The annual feed costs for a brood sow also tripled during the same period, from $13.05 to $41.40. Consequently, feeding trials focused on feedstuffs, such as pasture and screenings, which had little or no market value. Expansion of the herd at Brandon was postponed, in spite of the fact that over 200 young pigs had been marketed in the 12-month period prior to 31 March 1920.

Post World War I to Post World War II: 1920–1946 Although several breeds had been utilized in the previous work, in 1920 the main herd was restricted to Yorkshires, with a few Berkshire and Duroc–Jersey boars retained for crossing. Feeding studies continued to evaluate alternatives to cereal grains. These ingredients included pigweed seeds and recleaned screenings, large amounts of which were commercially available as "Standard Stock Feed." The added benefits from supplementing grain chop with animal by-products was confirmed, particularly when buttermilk was available. Its cost of $6/ton ($6.62/t) in 1920, compared with barley or tankage at $55/ton ($60.64/t) and $107/ton ($117.97/t), respectively, was obviously much below its feeding value. On economic grounds, the use of pasture could also be justified. Rapeseed was later proven the most suitable short-term crop for this purpose.

opposite page
Sheep-grading experiment, 1914.

above
Straw housing for pigs, 1925.

below
Sows and piglets at the Brandon piggery in 1925.

The advent of a national carcass-grading system in 1922 encouraged more comprehensive testing of market pigs. A farrowing house was completed at the experimental farm in the same year. It provided an opportunity to investigate annual production of two litters per sow and the appropriate management systems. By 1924, Brandon's herd numbered 20 brood sows and 3 boars, some progeny of which were sold to farmers for breeding stock. The swine program was given a new objective to establish Yorkshire strains that produced litters capable of developing into "select" bacon hogs on Manitoba feeds.

Farrowing in the spring and fall each year increased the number of pigs available for feeding studies. However, more intensive production required greater attention to the management of herd health. The McLean County system, which emphasized hygenic farrowing conditions as well as clean pens and pastures, was adopted in 1927 to reduce the incidence of internal parasites.

The list of new feedstuffs evaluated grew to include alfalfa, oilcake meal, and skim milk. Alternate methods of feeding, such as self-feeding versus hand-feeding, were also investigated.

The Experimental Farms Service and the Department of Agriculture's Livestock Branch presented a joint proposal in 1927 to establish a system for the advanced registration of swine by which superior breeding stock could be identified. Over the following 2 years, the Brandon Experimental Farm, among others, contributed to the data on sow productivity and performance of litter subgroups, including carcass evaluation. This information formed the basis of the advanced registry program that was established in 1929. From such early beginnings and numerous subsequent modifications, the present record of performance swine improvement program was developed.

In 1929, various performance indicators were recorded for the Brandon herd. The 18 spring-farrowed sows averaged 12.1 pigs born and 9.1 weaned. Pigs reached an average market weight of 201.4 lb (91.4 kg) at an average age of 202.3 days. Carcasses averaged 30.2 in. (76.7 cm) in length, with a maximum of 1.87 in. (47 mm) of fat at the shoulder and a minimum of 1.09 in. (28 mm) of fat at the loin. Also of interest was the use of cod-liver oil as a daily supplement for sows during gestation and lactation. The existence of some vitamins had been known for several years, but their use as supplements in livestock feeding had not been considered necessary or economical. The increase in intensive housing and levels of production was to result in the appearance of micronutrient deficiencies. The cod-liver oil (a rich source of vitamin A) produced some benefits, but not at a level high enough to cover its cost.

Climatic and economic conditions during the Dirty Thirties had a debilitating effect on agriculture in the Prairie Provinces. The swine program at Brandon was considerably reduced for the first half of the decade. In 1934, it was thought wise to terminate the herd because of the presence of chronic hemorrhagic septicemia and a potential outbreak of hog cholera. Following thorough disinfection of the premises and an appropriate period of vacancy, the breeding herd was reestablished in 1935 using pigs from the Central Experimental Farm in Ottawa and the experimental stations at Lacombe (Alberta) and Rosthern (Saskatchewan).

In 1934, Swedish Landrace pigs were imported into Canada so that their merit could be compared with that of the indigenous Yorkshire breed. The animals were distributed to Ottawa, Melfort, Lacombe, and Brandon in 1935. Data were collected until 1939. The results indicated that carcasses from both breeds were of similar quality. However, the Yorkshires were more prolific, weaning approximately two-and-a-half more pigs a litter than the Landrace sows did. Further use of the Landrace breed in Canada was thus discouraged.

Management practices for intensive pig production had developed to the extent that oral supplements were routinely used to avoid deficiency symptoms in spring-farrowed litters. Iodine was supplied to prevent goiter, and iron to prevent anemia. Piglets were inoculated before weaning against hemorrhagic septicemia.

Although feeding studies in the 1930s continued to evaluate the use of skim milk and tankage, attention was also being paid to the cereal components of the diet. Comparative information on the feed value of each of the major cereals, as well as millet, was obtained. Differences were revealed between feed (Trebi) and malting (OAC 21) varieties of barley. Many nutritional experiments were performed through the years of World War II when hog production nationally expanded at a rapid pace. However, 1942 saw the reappearance of breeding studies at Brandon. The experimental farm joined in a cooperative project with the Department of Agriculture's Production Service to develop strains of pigs with high prepotency for desirable commercial characteristics and complete absence of common abnormalities.

The initial phase of this project involved three successive generations derived from sire to daughter and then full sib matings. It gave ample evidence of the detrimental effects of such inbreeding. The second phase, in which boars from inbred lines at Ottawa were used on the Brandon lines, was even less encouraging. The progeny did not demonstrate increased vigor. They had lower advanced registry scores than those for the parental lines. There was evidently a need for better understanding of the application of genetics in swine production. In contrast swine feeding was relatively sophisticated, with feed formulation and ingredient analysis becoming accepted practices. Further efforts at Brandon would be devoted to swine breeding.

above

Hog houses, 1966.

center

G.W. Rahnefeld, using the backfat probe on a pig in 1962.

below

Bred Lacombe sows from Lacombe winter litter, 1957–1958.

Postwar expansion: 1947–1975

Support for agricultural research increased to the point that, at Brandon, specialization became possible and necessary. Selection studies had become the major direction of all work with livestock. Responsibility for the cattle and swine programs was assigned to W.M. (Norm) MacNaughton from 1948 to 1960. He would initiate new experiments in animal genetics. By 1950, after completing a series of tests to compare coarse- and fine-grinding of feed grains, the transition from feeding to breeding studies was final. There would be little mention of nutrition for the next quarter century.

Progress in the cooperative inbreeding project, initiated in 1942, was slow. Although two additional inbred lines (McPhail and Cowing) were established in 1947, the comparisons with results from outbreeding still favored the latter. The project was eventually terminated in 1955. The following year, an experiment was set up to compare the recommended method of selection using performance records with the phenotypic selection, or "eyeballing," often practised by pig breeders. Initial results were quite similar. Unfortunately, there was no subsequent report to indicate which method was superior.

During this time, the management system adopted for the selection studies usually involved the transfer of spring litters (at 10–14 days after farrowing) to individual pasture lots equipped with huts. Creep feed was provided from 2 to 8 weeks of age when weaning occurred. Subsequently, pigs were fed according to advanced registry procedures. Appropriate data were then obtained. The system had a low labor input, and the feed requirements were found to be similar to those for raising pigs in the barn. In 1957, the averages for 240 pigs raised by this method were 42.3 lb (19.2 kg) at weaning weight, 37.5 lb (17.0 kg) of creep feed per pig, 194 lb (88.1 kg) at market weight in 156 days, postweaning feed conversion of 3.68:1, and total feed cost (excluding sow feed) of $14.96.

Over the next 2 years, the effects of weaning earlier at 6 weeks were investigated for sow and gilt litters. In spite of the apparent advantages, the practice was not immediately adopted. The high incidence of preweaning mortality, which could reach 30% even in well-managed herds, also received some attention in 1958 when feed grade antibiotics were becoming available for livestock use. However, the inclusion of high levels of chlortetracycline in the sow's diet did not improve litter size or survival rate.

When MacNaughton left Brandon in 1960 to assume the position of superintendent at the Melfort Experimental Farm in Saskatchewan, G.W. (Gunther) Rahnefeld joined the staff in 1961 as his successor in animal genetics. E.E. (Ernie) Swierstra, an animal physiologist, came on staff the following year and initiated studies on reproductive processes in the boar. Related studies in the female pig commenced in 1966 with the addition of G.W. (Gerry) Dyck. R.L. (Bob) Cliplef was appointed in 1967 to undertake meats research.

The increasing popularity of crossbreeding in the commercial swine industry led to a long-term breeding project at Brandon from 1962 to 1974 with two new herds. The project utilized Yorkshires, already established, and Lacombes, a new Canadian breed. The Lacombe pigs were selected for maximum postweaning growth rate (from 6 weeks to market weight) over 11 generations, while the Yorkshires served as a pedigreed control population. Data from each breed and from additional crossbred progeny were examined to determine the effects of selection for the single trait, as well as the correlated responses. In summary, selection for maximum daily gain improved postweaning growth rates in the Lacombe and crossbred progeny. However, there were a few adverse effects, notably the increase in total carcass backfat and the poorer scores for color, texture, and marbling of lean that became apparent in the selected population.

To demonstrate the value of performance records as a basis of selection in commercial practice, a 2-year study involving pairs of Lacombe littermate gilts bred to either fast- or slow-growing Yorkshire boars was conducted in 1964–1965. Performance of the crossbred progeny to market weight revealed the benefits in feed utilization and growth rate from using a superior sire. A later study in 1970 confirmed the significant effect of the sire on litter size.

The initial work in reproductive physiology at Brandon was prompted by the development of artificial insemination (AI) for swine commercially in Ontario by 1962. During the next 14 years before Swierstra's transfer to Lethbridge in 1976, considerable information was obtained about the process of spermatogenesis. Other studies looked at the effects of environmental temperature and the frequency of collection on quality and quantity of semen produced by boars from the two breeds. The results led to practical recommendations on boar management that were of value both to swine breeders and the AI industry. Attempts were also made to capitalize on the young boar's potential as a market pig by utilizing the Russian method of partial castration, but without noticeable success.

Research into female pig reproduction commenced in 1966. The initial objectives were to determine why litter size differed among breeds and between gilts and sows. Other work focused on the development of management procedures to reduce embryonic and fetal mortality. Several differences between the two herds at Brandon were soon apparent. Ovulation rates tended to be higher for the Lacombe gilts, but age at puberty was the same for both breeds. Yorkshire sows produced relatively larger litters and they returned to estrus quicker than the Lacombes did. Studies were conducted on the growth of the reproductive system from birth to puberty and after lactation. Several experiments investigated how the level of feeding affected reproductive performance of gilts and primiparous sows. Methods to control estrus with natural or synthetic compounds were also examined.

The meats research program, initiated in 1967, was able to identify breed differences in the quality of carcasses from pigs produced during the selection study. A preliminary report in 1971 indicated that loin chops from Lacombes were more acceptable to the consumer than those from Yorkshire pigs. However, after evaluation of 3300 carcasses, the Yorkshires scored higher for color and texture of lean than the Lacombes or the crossbreds (according to a subsequent report in 1973). The former breed was also found to have a lower apparent incidence at 1.4% of pale, soft, exudative (PSE) pork than the Lacombes at 7.7%.

By the early 1970s, involvement with the beef cattle project was taking an increasing amount of the geneticist's time. An additional researcher was hired in 1973. Apart from participating in the ongoing breeding studies, I. (Ian) Garnett devoted considerable effort to the development of a selection index that combined the growth, backfat, and feed conversion measurements (economically weighted). This index was to be adopted for the pigs at test stations in the record of performance (ROP) program.

The continued expansion of cattle and swine research at Brandon led to the eventual demise of the poultry program in 1975. The poultry geneticist, J.H. (John) Strain, had been head of the Animal Science Section since 1970. Subsequently, he was able to contribute to the statistical aspects of the work with swine until his retirement in 1982. Rahnefeld succeeded him as head of the section that year. Remodeling the poultry facilities to accommodate pigs added considerably to the housing capacity.

The last decade: 1976–1985 The establishment of a comprehensive program could not be achieved immediately, because of several changes in personnel that occurred at Brandon. Swierstra transferred to Lethbridge in April 1976. His successor, D.L. (Dan) Grinwich, was not appointed until July of the following year. After a long absence, nutrition reappeared in the program in August 1977 when R.R. (Raja) Grandhi joined the staff. Garnett resigned 2 months later, and genetics temporarily ceased to be an active part of the swine program.

Remodeling of the poultry buildings for the swine program was delayed by budgetary restraints. Prior to 1976, one conversion had increased the capacity for farrowing (with 70 pens in building No. 42). Subsequent conversions were approved to produce a finishing barn (with 88 pens in building No. 21) and a farrowing barn (with 49 crates in building No. 26). New construction of a 150-sow gestation barn (building No. 55) was completed in May 1983.

A variety of studies was conducted on factors that influenced the performance of gilts and sows, in recognition of the high priority given to research on sow productivity by the swine industry. Additional nutrition studies were devoted to increasing the efficiency of producing market pigs. Meats research focused on the differences between pork from male and female pigs and on the factors that affected the incidence of sex taint in products from males.

The program enjoyed further expansion in 1980 with the addition of a second nutritionist. A.G. (Adrian) Castell had transferred from the Melfort Research Station. A swine geneticist, R.M. (Bob) McKay, came on staff 2 years later. He introduced the Hampshire and Landrace breeds into the Brandon herd at this time, while the Lacombe pigs were phased out. McKay is utilizing Yorkshires and Hampshires to examine the effects of continued selection for reduced backfat on female reproductive performance in each purebred line and any related responses. Landrace pigs are being used to derive crossbred progeny for the experiments in nutrition and reproductive physiology. A postdoctoral fellow, M.M. (Mary) Buhr, contributed to these physiological studies. In 1982–1983, she investigated the endocrine control of puberty and hormonal aspects of corpus luteum function in the pig.

By 1985, the future direction of the swine program was established. The capacity for multidisciplinary research was in place. Given the cooperation from support staff (without whose help in the past the work could not have been done), Brandon will continue to tackle the ongoing concerns of the swine industry.

Yaks

During the pioneer period, the Department of Agriculture was continuously searching for new species of animals that could produce meat efficiently in the extreme northern parts of Canada. Through the efforts of E. (Ernest) Thompson-Seton, a well-known naturalist, a herd of six yaks (*Bos grunniens*) was presented to the experimental farm by His Grace, the Duke of Bedford. As these animals are native to Tibet and exist under conditions of excessive cold and deep snow, it was reasoned that they should do well in areas where ordinary cattle could not range without winter protection and feed.

These six animals (two males and four females) arrived in July 1909 after a 4-month trip from England. They were placed on a 35-acre (14-ha) range with considerable natural shelter and a creek to furnish water. During the fall, the yaks foraged for themselves. However, on the approach of severe weather, hay and straw were provided to supplement their diet. Some grain was fed daily over the winter, but the older bull and one of the cows died. No young were produced the following year.

Despite its origin and habits, the yak did not prove useful as a meat animal for conditions on the prairies. All further work was immediately abandoned.

Chapter 3
Plant research

Barley

Barley research began in earnest at the Brandon Experimental Farm in 1924 with the establishment of a breeding program. Before then, all of the work with barley was for demonstration purposes. In that year, S.J. Sigfusson was appointed cereal breeder, with a mandate to develop barley varieties suited to western Canada. Unfortunately, before any of his efforts could be realized, Sigfusson was the victim of a drowning accident in 1933. The work was halted for 3 years until the appointment of W.H. (Walter) Johnston in 1936 to the position of wheat and barley breeder. The efforts of this one man would prove to be the cornerstone of barley research in the Canadian prairies.

Johnston is a native of Olds, Alta. His professional work began when he obtained a degree in agriculture from the University of Alberta in 1931. This was followed by a master's degree 1 year later. In his illustrious career spaning some 36 years, Johnston is credited with developing more barley varieties than anyone else in the country. He produced nine varieties, single handedly or in collaboration with others. Collectively, these varieties have generated well over $200 000 000 of additional farm income (see Table 1). Johnston was also among the first to conduct research into breeding for disease resistance in barley. This work gave rise to varieties that incorporated known sources of resistance to many diseases commonly found in western Canada. The work was accomplished by a team that included D.R. (Dick) Metcalfe and K.W. Buchannon, colleagues at the Department of Agriculture. From the 1950s to the 1970s, Johnston headed a group of professionals from government and university working to improve barley varieties for the eastern prairies. Through his initiative and leadership, much was done to benefit barley production.

Table 1 Estimated increases in barley production for western Canada from Brandon varieties (R.I. Wolfe and M.C.J. Therrien)

Plush	Main years of production	1939–1954
	Total area	3 644 000 ha
	Total production	4 898 000 t
	Extra production	733 000 t
Vantage	Main years of production	1949–1960
	Total area	1 660 000 ha
	Total production	2 231 000 t
	Extra production	218 000 t
Vantmore	Main years of production	1954–1961
	Total area	60 000 ha
	Total production	81 000 t
	Extra production	4 000 t
Parkland	Main years of production	1957–1967
	Total area	6 281 000 ha
	Total production	12 158 000 t
	Extra production	1 325 000 t
Keystone	Main years of production	1962–1967
	Total area	235 000 ha
	Total production	506 000 t
	Extra production	42 000 t
Conquest	Main years of production	1966–1982
	Total area	17 016 000 ha
	Total production	36 680 000 t
	Extra production	3 668 000 t
Paragon	Main years of production	1970–1973
	Total area	872 000 ha
	Total production	1 952 000 t
	Extra production	78 000 t
Bonanza	Main years of production	1971–1982 (and continuing)
	Total area	12 254 000 ha
	Total production	27 952 000 t
	Extra production	1 677 000 t
Klondike	Main years of production	1977–1982
	Total area	1 051 000 ha
	Total production	2 468 000 t
	Extra production	74 000 t
Bedford	Main years of production	1982–1984 (and continuing)
	Total area	584 000 ha
	Total production	1 451 000 t
	Extra production	84 100 t
Johnston	Main years of production	1982–1984 (and continuing)
	Total area	839 200 ha
	Total production	2 131 000 t
	Extra production	173 000 t

Total extra tonnage = 4 408 100 t
At $100/t = $441 000 000 additional revenue in 1982 dollars

When Johnston began working with barley in the 1930s, few prairie farmers grew varieties as we would know them today. The early types were from either eastern Canada or Europe. They were not well suited to the prairie climate. Yields were not consistent, and agronomic performance generally left much to be desired. It was Johnston's task to develop a more satisfactory barley through careful breeding and selection. In 1939, a new variety was finally licensed under the name of Plush. Johnston completed the work that was initiated by his late predecessor, Sigfusson. Plush had the advantages of uniformity, shattering resistance, and adaptability to the region. This first effort was greeted with success, as Plush soon became widely grown.

By the 1940s, farm practices and equipment had improved. With such progress came new barleys to meet the needs of the times. In 1947, another variety was licensed under the name of Vantage. It had advantages over the others, including higher yield, improvements in straw and spike characteristics, and rust resistance. Outbreaks of stem and leaf rust were major problems in cereal production at that time, accounting for serious crop losses. The release of Vantage kept those losses to a minimum and averted a potential disaster in the barley industry. Building on the success of Vantage was the selection named Vantmore, which was licensed in 1954. This variety combined the stem rust resistance of Vantage with resistance to stem or root rot. The crop could now be grown in areas previously not under barley cultivation because of this disease. Vantmore was the first variety out of Brandon to be considered a team effort, combining the expertise of more than one individual in related fields (like plant pathology and cereal chemistry).

The cooperative work of Johnston and Metcalfe would produce three more varieties that would add significantly to barley production in western Canada. The first of these, licensed in 1956, was Parkland. It was higher in yield and disease resistant. Moreover, it could be used for malting. A barley variety that is classified as a malting type must produce sufficient malt extract to meet standards set by the Canadian Association of Maltsters. Malt extract, or simply malt, is a key ingredient in the manufacture of beers, ales, whiskey, and certain candy confections. Hence, a malting variety is more profitable than one used for animal feed. Parkland did well as a malting variety, despite a few problems, since it performed satisfactorily in the prairie parkland. Further improvements in yield and smut resistance led to the development of Keystone in 1961. Although these improvements were welcome, Keystone was not a malting variety. It was soon eclipsed by the development of Conquest malting barley in 1965.

Covered barley stooks, 1961.

Conquest proved to be a major advancement over Parkland. The largest single factor distinguishing this variety from others was the improvement in malting quality. Conquest also had advantages in yield and disease resistance, but more importantly, it was an early-maturing variety that could be grown extensively on the Canadian prairies. Soon after its release, Conquest occupied much of the barley area in western Canada. Producers were encouraged by its saleability as a malting variety and its good agronomic performance. The barley research done at Brandon and collaborating institutions was now developing an international reputation for excellence.

The year 1966 was one of change for the barley program at Brandon. Metcalfe was transferred to the Winnipeg Research Station to continue in barley disease and malt research. He had worked with Johnston since 1948, contributing to the development of many varieties. Metcalfe was the individual mainly responsible for incorporating disease resistance into the new barleys. Despite the move, cooperative efforts still continued with Johnston at Brandon. This work led to the release of two more varieties. They were Paragon, licensed in 1967, and Bonanza, licensed in 1970. Paragon did not have a major impact on barley production, as it was late maturing. As well, there were some difficulties with the seed. However, Bonanza was quite a different matter. It stands as the most widely grown barley variety in Canadian agricultural history. In each year of commercial production from 1972 to 1984, Bonanza has accounted for at least 20% of all the barley area in western Canada. In total, some 1.3 billion bushels (47.3 billion L) of this variety have been grown on at least 2 million acres (0.8 million ha) annually since 1972. Tens of millions of dollars were added in profits to producers and the agricultural economy. What made Bonanza so successful was a combination of malting quality (which became the national standard for barley varieties), good yield, and adaptation to most parts of the prairies. This allowed many producers to grow Bonanza profitably, especially those who were paid a handsome premium when their harvest was accepted as malting grade. Bonanza was released near the end of Johnston's career. It was only fitting that this very successful variety crowned the long and productive professional life of a man whose name has become synonymous with barley breeding in western Canada. For his many years of outstanding achievement in the field of barley research, Johnston received an honorary doctor of science degree from the University of Manitoba in 1967. Several other major honors were bestowed from 1967 until his retirement from service in December of 1971.

In 1968, a few years before Johnston retired, R.I. (Bob) Wolfe was appointed barley breeder at the Brandon Research Station. Wolfe pursued studies left by his predecessor on breeding resistance to some of the major diseases. Work also continued on basic research into the genetics of the barley plant itself. This research provided a basis for Wolfe's varietal development. Since Johnston was already producing malting types, Wolfe was given the task of developing new feed varieties. As with other barleys developed at Brandon, these new feed varieties would incorporate disease resistance with good agronomic performance. They were to have substantial improvements in yield over currently available malting varieties. Previously, feed barleys had yields that were only somewhat better. In his 13 years at the research station, Wolfe produced four new varieties and was mainly responsible for a fifth. All of these would be high-yielding feed types.

The first one was Klondike, licensed in 1976. The hybrid that eventually produced this variety was actually crossed by A.J. (Al) Klassen, who was at the research station from 1966 to 1968. Though his stay at Brandon was brief, Klassen went on to play a major role in the development of Canada's Cinderella crop—rapeseed. Klondike represented a significant change in barley varieties, in that it was the first feed type to outyield the predominant malting varieties by some 5%. In effect, this yield increase made feed barleys an economically viable alternative to malting varieties. Quickly following the development of Klondike was Bedford, which was licensed in 1979. Bedford was a high-yielding feed variety that was particularly well-adapted to Manitoba. It had good disease resistance and strong straw, and it could outyield other varieties by as much as 10%. These characteristics made Bedford very attractive. By 1984, it was grown on over one-third of all the barley area in Manitoba. In 1980, Wolfe produced his third variety in six years. This was Johnston, named in honor of Walter Johnston. It was another high-yielding feed variety that found its place in Alberta, Canada's number one producer of barley. By 1984, Johnston became Alberta's predominant feed barley in terms of total seeded area.

Wolfe left Brandon in 1981 for Beaverlodge, Alta., to continue his plant-breeding career in the Peace River District. The work that he initiated in barley genetics and smut resistance was to continue, however. There were two more barleys that would come from Wolfe's efforts. Leduc was licensed in 1981. This feed variety was very high in yield, and it had shorter and more erect straw than Johnston. Leduc was primarily adapted to Alberta. It could also be cultivated in some parts of Saskatchewan and Manitoba. Although Leduc is not grown as widely as Johnston, it is still one of the top feed varieties in western Canada. Lodging was still a problem, however, particularly under higher levels of moisture and more intensive land management practices. A shorter- and stronger-strawed barley of similar yield potential was required. These qualities were achieved with Heartland barley, which was licensed in 1984. Its development can be attributed mainly to Wolfe, but others were involved in the final work toward licensing. They were K.W. (Ken) Campbell who worked as the malting barley breeder from 1974 to 1981, R.B. (Byron) Irvine who was appointed barley physiologist in 1981, and M.C.J. (Mario) Therrien who came to Brandon as the barley breeder in 1982. Heartland has a number of advantages over Johnston and Leduc. They include a much shorter and very strong straw, improved disease resistance, a fairly wide range of adaptation, and higher yields over other feed varieties in certain parts of the prairies. Heartland will go into commercial production in 1986. Based on its performance so far, this variety will be successful, particularly in the eastern and central regions, where its superior straw and resistance to net blotch will have added value over other feed types.

As was mentioned earlier, Campbell joined the barley program at Brandon in 1974. He continued work that Johnston left as the malting barley breeder in 1971. During the 1970s, Bonanza was by far the predominant malting variety in Canada. In fact, it had the largest production area of any barley in North America. This variety was also strongly preferred by the malting industry. Consequently, it would be difficult to improve on Bonanza's overall performance. Campbell was faced with the unenviable task of developing a variety that would surpass Bonanza in malting quality and agronomic characteristics. In his 7 years at Brandon, he was unable to do so. However, Campbell did develop new techniques for the current program that has kept its efforts up-to-date. Some of the research was in the area of improving malting quality using hybrids between two-row barley and six-row barley. Campbell also worked on methods to shorten the time required to produce a new variety, such as the rapid production of genetically engineered uniform barley hybrids known as the doubled haploidy method. He began a breeding program for two-row malting barleys, which had not been done at Brandon previously. Campbell left the research station in 1981 to continue his career with the Agricultural Division of Ciba-Geigy.

The present barley-breeding program is derived from the many successes enjoyed over the past 40 years. Currently, over 50% of all barleys grown in western Canada (and over 80% for the eastern prairies) are varieties that were developed at Brandon. Therrien and Irvine have taken over responsibility for this work. At least 50% of their resources are devoted to the research and development of feed barleys. However, the program does not attempt to specialize in one type of barley, such as was done in the past. Rather, an integrated system has evolved, which combines classical breeding methods with technological advances in breeding, physiology, pathology, agronomy, and biochemistry. The emphasis now is on essentially three barley types. The first includes a short, high-yielding feed barley with strong straw that is similar to Heartland. Another is a disease-resistant, two-row barley with high malting quality, being advanced for the eastern prairies. The third is a hull-less barley variety that will be agronomically and commercially competitive with currently available semidwarf feed wheats. The hull-less product is aimed particularly at the poultry- and swine-feed industries. Because the hull-less studies are an entirely new undertaking for the barley program at Brandon, its release is a long-term goal.

Along with the development of barley varieties, research will continue on the genetics of disease resistance and the inheritance of certain important traits. Added to these studies is research into the whole new area of barley physiology and agronomy. The work will explore a number of difficult questions: What is lodging? What is drought tolerance? How can such traits be screened, modified, and improved? Brandon's program has the flexibility to meet future requirements for barley as a commodity in the changing world of agribusiness. The needs of both the producer and industry will determine the program's role in the years to come.

Barley varieties, showing OAC 21 (*left*) and Gartens from Portage (*right*).

Corn

The history of corn research at Brandon begins with the opening of the experimental farm. In the first crop year, a two-horse wheat drill was used to sow 11 open-pollinated varieties of corn in 40-in. (102-cm) rows on 28 May 1889. The crop showed great promise, as one variety produced 17 511 lb of green yield per acre (19 612 kg/ha) when cut on 6 September. In 1890, the number of varieties grown increased to 32, and because of very favorable weather, the green yields were as high as 46 tons/acre (103 t/ha). The date of this harvest was 29 August. The fodder was cured in shocks of about 600 lb (272 kg) as green weight, and the cured fodder was fed to both horses and cattle.

Initially, corn researchers tackled the questions of which varieties were the best to grow, which agronomic practices would result in the highest yields, and how the farmer could utilize the crop. As new questions arose from interested farmers, the Brandon Experimental Farm entered into further investigations to find the answers.

In 1891, a common grain binder was proven useful for cutting and binding corn. Corn was also shown to be readily eaten by livestock, either as ensilage or in the dry state. Besides the variety trials, 4 acres (1.6 ha) of North Dakota Flint were grown in 1892 for the farm silos; this event heralded the start of feeding trials. Also that year, the first recommendations were made to farmers regarding the agronomy of the crop. In 1893, 11 acres (4.5 ha) of corn were sown for ensilage purposes. There were also the variety trials and a related study to investigate two methods of sowing, in hills or with seed drills. The hills versus drills experiment went on until 1906, and it was conducted again in 1911 and 1912.

Another trial from 1896 to 1908 examined the row spacing of corn. An 11-year average of three corn varieties showed that row spacing of 24–30 in. (61–76 cm) resulted in the highest yields. However, a row spacing of 36–42 in. (91–107 cm) was required for proper cultural control of weeds. Other work evaluated wheat yields after corn fodder (1885), compared different methods of storing dry corn fodder (1895), and measured the feed value of corn ensilage for milch cows (1896).

In 1900, a very interesting observation was made. "The corn was several inches above the ground on June 8th, and the eight degrees of frost which was then experienced cut it level with the ground; but it quickly recovered and was apparently none the worse for it." This notation was early recognition of the hardiness that crops would need to survive in a difficult prairie climate.

Corn was fed to livestock every year. In 1906, however, ensilage was not given to dairy cows because the feed was feared to taint the milk, despite evidence to the contrary provided by feeding trials 10 years earlier. Fortunately, the fear was soon dispelled, and the experimental farm gained a reputation for making quality corn silage. The question of whether to use corn silage or dry corn fodder (cured in stooks) as a feed for fattening steers was answered in a 1913–1914 experiment. Steers on corn silage gained 1.88 lb (0.85 kg) a day or 340.50 lb (154.59 kg) in 6 months compared with 1.44 lb (0.65 kg) a day or 260 lb (118.04 kg) in 6 months on dry corn fodder. The cost of producing corn silage was estimated in 1914 at $22.13/acre ($54.64/ha) or $2.15 per green ton ($2.37/t) and in 1915 at $14.20/acre ($35.06/ha) or $3.13 per green ton ($3.45/t). Poor weather and yields in 1915 accounted for these differences in cost.

One other feeding trial that was of interest then was "hogging off" corn. Hogs were allowed into the corn fields to feed at will on the cobs.

Variety trials continued annually in unreplicated plots. However, in the 1910s, reports earned greater reliability by including a summary of 3–5 years of green yield data for each corn variety. The late 1910s and early 1920s saw many experiments on the cultural practices of corn production. The experiments ran for almost a decade and compared crop rotation with corn versus summer fallow, four methods and times of plowing, nine seedbed preparations, five seeding dates, twelve methods and rates of planting, eight methods of cultivating the growing crop, eight methods and times of applying barnyard manure, and five rates of applying two different kinds of manure.

above
Cutting corn at the experimental farm in 1916.

below
Grain corn showed promise in the eastern prairies.

opposite page
Early production of corn silage.

In the mid 1920s, the nature of corn research at Brandon changed. Variety trials were replicated for the first time in 1923. Two years later, the experimental farm also recognized that "varieties giving the greatest tonnage of green fodder did not necessarily produce the highest yield of dry matter." Consequently, the farm began to report yields on a dry matter basis. During the same period, the source of seed for open-pollinated corn varieties was found to play a very large role in variety performance. This observation would, in fact, lead to the idea of variety improvement. Inbred development was started at Brandon in 1924. By 1930, there were 400 self-fertilized lines, including 192 from Northwestern Dent, 106 from Quebec No. 28, 57 from Manitoba Flint, and 37 from Minnesota No. 13. Some of these were treated with "smut," and selections were made for resistance to this disease. In 1930, line crosses were also initiated. Other breeding methods used were mass selection and ear-to-row selection.

Variety trials became more sophisticated in 1927 when the University of Manitoba and the experimental farms at Brandon and Morden began cooperative testing of corn for both ensilage and grain. These cooperative trials have been in place ever since.

During the late 1920s, other studies at Brandon looked at the effects of crop rotation, manuring, and date of planting; the profitability of hogging off corn; and the relative value of corn versus barley feed for egg production.

The corn-breeding work at Brandon ended in April 1939 when G.F.H. Buckley was transferred to the Harrow Experimental Farm in Ontario, where he was the corn breeder until his retirement in 1958. The Brandon breeding material went to the Morden Experimental Farm. S.B. (Sig) Helgason was starting a corn-breeding program there, with the objective of producing hybrid corn suitable for mechanical harvest.

The level of corn research at Brandon dropped off slightly from the 1940s to the 1960s, probably because of a turnover in personnel. However, interest among farmers was still high; a corn symposium was included in the program of the 1941 Manitoba Agronomists' Conference. Variety testing took place every year at Brandon and from 1938 to 1954 at the Melita Substation as well. The only agronomy work during this time was a 1940–1947 study on the application of barnyard manure, green crop manure, or commercial fertilizer for wheat and corn on a Souris light loam soil.

In June of 1955, the Manitoba Corn Committee was established with a mandate to formulate recommendations to farmers on corn hybrids and cultural practices, as well as to support new corn hybrids for licensing. The University of Manitoba and the experimental farms at Brandon and Morden expanded their activities in cooperative testing which began in 1927. They

became sites for official variety trials and for studies on fertilizer rates (1955–1959) and on corn spacing (1955–1959), among others. In 1965, Brandon was involved with D.M. Brown of the Ontario Research Foundation in developing the corn heat unit as a system of rating varieties.

When R.I. (Bob) Hamilton arrived in 1969, the corn program gained prominence at Brandon. In 1970, numerous experiments were initiated in which corn was compared with wheat, barley, and oats for maximum dry-matter production per unit area. Another study evaluated the economic benefits from four types of management in corn production. Many physiology trials were undertaken, for example, to determine the interactions between date of sowing and variety or between date of sowing, population density, and seeding depth. Other activities examined the effect of salinity on corn. Work started on establishing a nitrogen-response curve. Also in 1970, R.D. (Dick) Dryden began a new program to evaluate cultural practices and herbicide treatments for weed control in corn. In the mid 1970s, Hamilton joined with C.F. (Carl) Shaykewich, a soil scientist at the University of Manitoba, in setting up approximately 24 off-station sites in western Manitoba and eastern Saskatchewan for the development of a map of the area based on corn heat units. The combination of these research efforts with successful corn-breeding programs, a cooperative grain-corn market (Seagram Distillers in Gimli, Man.), and excellent extension activities (the Annual Corn School by the Manitoba Corn Growers' Association) resulted in a dramatic increase in production of grain corn during the late 1970s and early 1980s.

In the early 1980s, work on corn continued at the Brandon Research Station with studies in physiology, soil fertility, and weed control. Hamilton was transferred to the Ottawa Research Station in January 1983, where he became chief of the Forage Crops Section. He was also put in charge of the corn program there. Another major change occurred in 1983 with the appointment of W.N. (Wally) Migus. He officially reintroduced a breeding program aimed at developing earlier grain-corn hybrids for the eastern Canadian prairies. For the first time, two corn hybrids (N0488 and N0004) developed at Brandon were supported for licensing by the Manitoba Corn Committee in 1984 and were released to private industry for marketing. This achievement recognizes a very promising research program on a major crop at the Brandon Research Station.

Forages

As early as 1888, Superintendent Bedford commented in his annual reports on the increasing shortage of natural hay in the Brandon area and, subsequently, he established forage-variety tests. No information was available on the suitability of any of the native forages for relatively intensive grazing. Furthermore, the winterhardiness of many of the introduced European species could only be estimated. In that year, 37 forages were sown. Over the next decade or two, many perennial and annual forages were tested, including native and introduced wheatgrasses, wild rye, corn, millet, hemp, mangels, and sunflowers. Many of the perennials were too easily winter-killed, while the season was too hot or too short for many of the annuals; so the list of forages was quickly narrowed down.

The importance of forages was such that within a few years of the experimental farm's establishment, the test plots of forage crops were getting more attention from farmers than any other aspect of the farm. In order to quickly introduce superior species to the area, seeds from the test plots were saved and 1-lb (454-g) bags were distributed free to farmers. Originally, red clover was the perennial with the greatest potential, and oats mixed with pease [sic] was a successful annual forage.

By the turn of the century, alfalfa was considered promising and silage corn was being recommended. A seeding recommendation from the late 1890s advised farmers to sow a wheat crop first, and then when it was 2 in. (5 cm) high, to broadcast the grass and clover seed and harrow it in. This practice would thin the wheat, destroy many germinating weeds, and bury the seed. By 1901, however, omitting the wheat crop was found to enhance the winter survival of the legume components of the mixture.

Other management recommendations made around this time included one advising farmers to cut alfalfa at the time of first bud bloom, and another, to avoid grazing alfalfa or clover in the fall in order to reduce winterkill and increase the amount of snow trapped. Alfalfa was then considered the most promising legume, and smooth brome, the best grass. When Austrian brome, as smooth brome was then called, was first evaluated around 1890, it was relatively unproductive. However, by 1900, it yielded well and farmers were satisfied. By natural selection it had quickly become adapted to the area.

Following a test some years earlier, inoculation of legume fields with *Rhizobium* was recommended from 1910. As commercial cultures of this nitrogen-fixing bacterium were not available, the experimental farm advised applying 100 lb (112 kg) of soil from a successful field for each new acre (0.4 ha) being prepared; soil was even provided for this purpose.

Before 1908, distinct varieties of perennial forages had not been evaluated; but from this date, tests began to include a range of varieties. At first, these were land races from various parts of the world. Bred varieties were gradually included. Their introduction and acceptance was slow. In the late 1930s, farmers were still being advised to produce their own forage seed.

Studies on seeding rates from 1910 to 1920 showed that the previously recommended rates had been too high, often by a factor of two or more. The revised rates were still higher than many now followed, probably because of difficulties with weed control. Seeding-date studies started at that time eventually gave rise to the current recommendations, but the considerable year-to-year variation in the weather made general advice difficult to formulate. The first feeding studies to assess palatability were also conducted during this period. Alfalfa and western wild ryegrass were then the dominant forages. Bromegrass was recommended on dry land but not on the better soils, where it was considered to be too persistent.

In the 1920s, sweet clover was beginning to be recommended for forage. Previously, it had been judged too fibrous and was grown only by honey producers and for green manure. Throughout the 1920s sweet clover rose in popularity. In 1930, it was grown by five times as many farmers as alfalfa was. Sweet clover accounted for 45% of the tame hay, compared with 3% for alfalfa.

In this decade there were not only big changes in the forages grown, there were also significant changes in the personnel and procedures used at the experimental farm. In 1922, the first forage specialist, R.A. Derick, was appointed. He was succeeded in 1928 by A.T. Elders, then by G.F.H. Buckley in 1929–1939, E.J. Britten in 1944–1947, H.A. Steppler in 1948–1949, J.D. Truscott in 1950–1953, A.T.H. (Hugo) Gross in 1954–1979, and R.G. (Richard) Simons in 1981 to the present

In 1923, for the first time, variety comparisons were based on dry matter rather than fresh weight. As the fresh weight depends on the water content, which varies considerably with the weather, this change meant a big improvement in the accuracy of the evaluations. In 1925, replication was introduced. Until then, each treatment or variety had been entered in a test only once, so it was impossible to tell whether observed differences were caused by the treatment or just by random variation between the plots. Repeating the treatments made it possible to estimate how much of the variation was due to chance and how much was due to the experiment; and, hence, how much significance could be given to the results.

A forage-breeding program, which was started by G.F.H. Buckley in 1925, gave rise to two varieties of yellow sweet clover, Erector and Brandon Dwarf, in 1938. White sweet clover had previously been preferred because the yellow was too prostrate. Erector is not only a tall yellow sweet clover, but it is also earlier and higher-yielding than other sweet clovers are. Since then, yellow sweet clover has predominated over a wide area. Brandon Dwarf is short in the 1st year and moderately tall in the 2nd year, and it has unusually fine stems.

In the 1930s, crested wheatgrass gained in popularity, especially for light soils and dry areas. Intermediate wheatgrass was introduced, but it was slow to gain acceptance.

By the late 1950s, there was increasing use of named varieties like Vernal, Ladak, and Rambler alfalfa; Lincoln bromegrass; and Climax timothy. Hybrid corn was used for silage. Other innovations in perennial forage management included recommending the use of tall wheatgrass and Russian wild ryegrass for saline soils. Western wild ryegrass had ceased to be significant. During this decade and the next, an extensive herbarium containing several thousand specimens was developed. It continues to be of use for weed identification. Between about 1960 and 1965, an extensive search was mounted for resistance to weevils in related species of sweet clover. Some resistance was located. However, with the existing techniques, the wild species could not be hybridized with cultivated plants to incorporate the resistance into agronomically suitable varieties. The weevil-deterrent factor has since been found harmful to livestock, and breeding work on sweet clover has ceased in North America.

A.T.H. Gross, with Vernal alfalfa in 1968.

During the 1960s and 1970s, the work in forages concentrated on determining the effect of different row spacings at seeding, cutting management, and fertilizers on yield and persistency. The main species under evaluation included bromegrass, crested wheatgrass, intermediate wheatgrass, and Russian wild ryegrass. Before then, forages had received little or no fertilizer. However, as the soil's natural fertility declined over the past century, crops began to show an increasing response to being fertilized. There is now greater awareness of the value of well-managed forages for on-farm use or as a cash crop.

Currently, work is focusing on finding the attributes of alfalfa that determine crop yield, so they can be used to select higher-yielding varieties. Existing varieties have improved winter survival and resistance to diseases and insects, but crop growth itself has changed little. Tests are continuing on perennial forage varieties and on management practices that improve forage production on the prairies.

Horticultural crops

During the early years of the Brandon Experimental Farm, much work was undertaken with shelterbelts, vegetables, fruits, and other horticultural plants that would assist in establishing a good and permanent farmstead for prairie settlers. One of the first projects initiated by Superintendent Bedford was to plant 650 native maples on what was later named Bedford Drive. In 1888, he seeded three-quarters of an acre (0.3 ha) of native ash, basswood, and maple, but these were destroyed by frost in the spring of 1889. By 1891, a total of 141 316 trees and shrubs had been planted to determine their hardiness and suitability for Manitoba conditions. They represented different species from eastern Canada, Iowa, Nebraska, Manitoba, northern Ontario, Russia, Siberia, and northeastern Asia, and included several hundred fruit trees and bushes. Large numbers of these soon died. However, others became the basis from which many millions of trees and shrubs were propagated for shelterbelt and ornamental purposes. In almost all cases, the survivors came from northern Eurasia or were indigenous to North America. Of the many plantings on the experimental farm, somewhat over 200 species and varieties are still living in the present arboretum and shelterbelt.

Large numbers of trees were grown at Brandon for distribution to farmers. Approximately 70 000 trees and cuttings had been supplied by 1891. The demand for these increased rapidly. Ten acres (4 ha) of maples and elms were grown in 1901 for the newly formed Forestry Branch of the Department of the Interior. In 1903, about 1 500 000 trees were given out. More trees were grown the next year, but they were distributed by the Forest Nursery Station at Indian Head, Sask. The Forest Nursery Stations were to assume responsibility for all such work after that date.

The propagation and distribution of fruit trees and bushes, shrubs, and ornamental trees have usually been done by the nursery trade. The experimental farm played an important role in demonstrating and recommending suitable species and varieties. It had another strong effect on the trade: Henry Patmore, founder of one of the first nurseries that still exists in Brandon today, worked with trees at the experimental farm before starting his business.

above

Maple trees lining Bedford Drive.

below

Apple-picking time at the experimental farm, 1929.

For about 20 years after the farm was established, several hundred packages of various shelterbelt, ornamental, and fruit seeds were distributed each year. Reports from farmers on the performance of these seeds led to the investigation of better methods of propagation. Many hedges were planted for protection from the wind. They were both trimmed and untrimmed. This early work helped to establish the value of caragana, maple, poplar, and willows for field and farmstead shelter.

Prairie settlers had been using native fruits when the Brandon Experimental Farm introduced the first cultivated types from eastern Canada. By 1891, a total of 2954 fruit trees and bushes had been planted at the farm. These plantings included apples, crab apples, pears, plums, cherries, currants, grapes, blackberries, raspberries, gooseberries, and strawberries. The importations were strongly influenced by Superintendent Bedford's friend, A.P. Stevenson of Morden, and by Professor William Saunders, director of the Experimental Farms Service in Ottawa. Hot dry summers and severe winters caused all but the hardier fruits to die. Even at this time, it was noted that "the seedlings raised at Ottawa from seed procured in Russia were very promising."

By 1894, none of the 300 varieties of apples tested had been found hardy. The results were similar for all plums except the native ones and for all cherries except sand cherries. On the other hand, small fruits proved more promising. Currants, gooseberries, raspberries, and strawberries exhibited at least moderate hardiness. Several strains of Siberian crab had also come safely through the winters, but their apples were too small for use.

In 1896, names were given to six selections of sand cherries that the experimental farm had introduced: Minnie, Brandon, Othello, Standard, Progress, and Challenge. Another outstanding introduction was named Champion in 1899. In 1902, four superior native plums were given the names of Brandon Ruby, Major, Souris, and Brandon.

Because no large-fruit varieties with sufficient hardiness and quality had been found, researchers decided to try to breed them from the few hardy species available. The first crosses between the Siberian crab and large apples were made in Ottawa by Professor Saunders in 1895. Crossbred seedlings began to arrive in Brandon in 1898 and continued for a few years. Most of these were destroyed by fire blight in 1901. Little else was done at Brandon in the way of fruit improvement. However, a particularly fine crab apple was later named Bedford in 1916, and it is still available.

above left

Hanging English cucumbers in the greenhouse, 1920.

above right

Rhubarb forced in a barrel, about 1920.

center

Heaps of squash, melon, and pumpkin with rows of carrots drying in the foreground, 1929.

below

H.H. Marshall contributed much to horticulture, especially during his Brandon period (1946–1970).

For several years, the climate at Brandon was known to be more severe than at Morden, where Stevenson was having better success with apples. The southern exposure, a feature of the sloping areas of the Assiniboine Valley, proved a particularly difficult location in which to grow trees—other than those with a high degree of hardiness. This problem at Brandon led to the establishment of the Morden Experimental Farm in 1916. From that date, fruit breeding and other activities in horticulture were centered at Morden.

The testing of vegetable varieties began at Brandon in 1889. The experimental farm evaluated large numbers of potatoes, peas, beans, tomatoes, onions, and many root vegetables. There were garden plots of lettuce, cauliflower, asparagus, pumpkin, squash, melon, cucumber, cabbage, and sweet corn, among others. All of these served useful demonstration purposes. Work was also undertaken to compare cultural methods. During the dry depression years of the 1930s, M.J. Tinline, the superintendent at Brandon, distributed hundreds of rhubarb roots and thousands of packets with flower and vegetable seeds.

H.H. (Henry) Marshall, who worked at Brandon from 1946 to 1970, conducted tests under the national potato variety and seedling trials. He developed and introduced five vegetables: Bountiful Hybrid tomato in 1952, Wheat City muskmelon in 1962, Burgundy swiss chard in 1962, Starfire tomato in 1963 with C. (Charles) Walkof, and Supersweet peas in 1967.

Several varieties of annual flowers were planted at the experimental farm in 1890. These were followed a short time later by a few perennials, particularly bulbs. By 1912, large numbers of flowering plants, trees, and shrubs were being grown. Marshall's work with ornamentals produced two new varieties of willows, Brand (*Salix maccallyana*) in 1968 and Carberry (*Salix lutea*) in 1968; two roses, Assiniboine in 1962 (given the 1965 Award of Merit by the Western Canadian Society for Horticulture) and Cuthbert Grant in 1967 (given the society's 1970 Award of Merit); and 17 herbaceous perennial flowers. Among these flowers were four new varieties of monarda, Souris in 1965, Minnedosa in 1965, Wawanesa in 1968, and Neepawa in 1970 (given the society's 1974 Award of Merit); two coral bells, Brandon Pink in 1957 (given the society's 1965 Award of Merit) and Brandon Glow in 1967; ten chrysanthemums, Susan Brandon in 1959, Cindy Brandon in 1959, Jocelyn Brandon in 1960, Joan Brandon in 1960, Julie Brandon in 1962, Bonnie Brandon in 1963, Linda Brandon in 1967, Tracy Brandon in 1967, Maud Brandon in 1968, and Vicky Brandon in 1968; and one lily, Stuart Criddle in 1965.

When Marshall was transferred to Morden in 1970, no further horticultural work was undertaken at the Brandon Research Station. However, an area of about 3.6 ha continues to be maintained for the arboretum, hedges, lawns, and flower gardens. They are enjoyed by large numbers of visitors each year, much to the credit of R.W.A. (Rod) March, the gardener at Brandon since 1974.

Oilseed and pulse crops

Over the past 100 years, research in the production and management of oilseed and pulse crops has been carried out at Brandon. The early work was primarily concerned with evaluation of these crops for regional suitability, animal fodder, green manure, and use in cereal crop rotations. Only fairly recently have studies been undertaken to improve varieties and management techniques for efficient commercial production.

In 1890, the Brandon Experimental Farm began 11 projects in field husbandry. Among these was one on the use of green manure. Rapeseed, as well as red clover, alsike clover, oats, and buckwheat, were each evaluated and compared with bare fallow in cereal crop rotations. Results reported in 1899 indicated that bare fallow gave much higher yields than green manure plots.

During this early period, rapeseed was also tested as a livestock feed. The crop proved acceptable for cattle. However, research on the use of rapeseed as green manure or animal fodder was terminated in 1910. In that year, field studies were begun to determine the value of mixed-farming rotations.

Not until the 1960s did the crop reappear in experiments at Brandon. Rapeseed had rapidly gained prominence as Canada's Cinderella crop. Early- and late-maturing varieties were assessed for their adaptability, yield, and oil content. Current research involves cultivar evaluation, weed control, plant nutrition, and crop management, especially for the new rapeseed varieties with low amounts of erucic acid and glucosinolate (registered as canola since 1979). Work at the Brandon Research Station has led to recommendations for the placement of phosphorus approximately 2.5 cm below or beside the seed. Fertilizer thus applied significantly increased the seed yield on phosphorus-deficient soils.

As with rapeseed, the first work with flax was in the historic rotation studies, which the Brandon Experimental Farm initiated in 1910 and continued until 1965. The objective (mentioned previously) was to determine the value of mixed-farming rotations that used various crops as a fallow substitute. Rather than fallowing the land after a cereal (usually wheat), researchers planted flax mainly to control weeds and to keep the soil from eroding. During the 55 years of cropping studies, several changes were made. The original treatments used to maintain or improve soil fertility included bare fallow, several green manure crops, and pen manure at different rates. In 1935, however, the rotations were redesigned to permit the use of herbicides and inorganic fertilizers, such as 11-48-0. Throughout these studies, flax proved the least responsive to applications of fertilizer or manure. However, the crop yielded well on soils with high fertility. Not until the 1960s were fertilizer techniques that would permit dramatic yield increases developed for use with flax. Experiments showed that maximum response of flax to phosphorus application occurred only when the fertilizer (11-48-0) was placed approximately 2.5 cm below or beside the seed.

For over 75 years, flax has been tested for adaptability, resistance to disease (such as rust), and yield, as well as for oil quantity and quality. The data are used to support the licensing and recommendation of new varieties for the Canadian prairies. The herbicide research for weed control in flax, started in 1935, still continues. The program includes the control of both broadleaved and grassy weeds by applying individual herbicides, tank mixtures, and adjuvants.

Brandon tested sunflowers as silage for cattle at the turn of the century. When the use of this crop switched from silage to oil by 1930, the experimental farm began to examine varieties for regional adaptability and seed yield. However, the climate was unsuitable for the late-maturing oil types, and work was discontinued. During the Dirty Thirties, interest was renewed in evaluating the crop for silage because of its drought tolerance. Sunflower breeding and evaluation was firmly established at Morden by the 1940s, and the Brandon program was terminated. In the late 1970s, with the introduction of hybrids, the crop became part of the oilseed program at the research station once again. Today, hybrids are tested for adaptability, yield, oil content, and disease resistance. Researchers are also investigating the effect of population density on yield of seed and oil. Plans are under way to develop further studies in plant nutrition and crop management.

above
Varietal testing of rapeseed, 1967.

below
Early sunflower research at Brandon.

Soybean research in Manitoba, and particularly at Brandon, is in its third phase. The first phase occurred in the early 1900s when the crop was introduced into the province from the United States. This phase, which lasted until the 1940s, concentrated on growing soybeans as a fodder crop for animals. Seed production was considered secondary and only as it related to the production of forage. Experiments showed that forage yields were high and that palatability and acceptance by livestock were satisfactory.

Unfortunately, soybeans were very expensive to grow at this time, especially with respect to weed control. A new era of crop production, however, was beginning in the province—that of the oilseeds. Sunflowers were established commercially early in the 1940s. Flax and rapeseed were being developed as potential high-yielding and high-oil-producing crops. Therefore, it was not surprising to see the introduction of phase two in soybean research centered around the development of early-maturing beans with high oil content.

In the 1950s, the breeding program at the University of Manitoba advanced two such varieties, Portage and Altona. Both were grown successfully in the regions of the province offering high corn heat units, but only for a short time. There were too many factors against their continued production, including unfavorable plant type, immaturity problems, unstable yields, lower protein content compared with American varieties, poor weed control and crop management, and the successful development of rapeseed as a strong competitor in the oilseeds market.

The third phase of soybean research began in the 1970s and is continuing today. Its objective is to develop early-maturing and high-yielding beans with high protein content for the eastern prairies. Brandon is engaged in cooperative breeding work with the Ottawa Research Station. Cultivars from Ottawa, the United States, and other locations in the Northern Hemisphere are evaluated at the Brandon Research Station for maturity, yield, and protein content. The success of this program depends not only on the development of suitable varieties but also on successful research into crop management. Information is essential on optimum date and time of seeding, population density and row spacing, plant nutrition and soil fertility, weed and disease control, cropping sequence, criteria for maturity, harvesting techniques, and crushing characteristics of the beans.

To date, four varieties have been licensed: Maple Presto (1977), Maple Amber (1980), Maple Isle (1984), and Maple Ridge (1984). They are among the earliest-maturing soybeans known and have been classified as Group 000 varieties. In the next 5 years, several new candidates from this group are expected to be proposed for licensing. A well-defined management package has been developed, although problems are still being investigated. Paramount among these problems is that of dinitrogen fixation.

Early in the development of Group 000 varieties, the protein content was found to be below that desired by the crushing industry, namely, a minimum of 40% on a whole-seed basis. The premise for developing a high-protein seed crop on the prairies is to reduce Canada's dependence on the importation of high-protein soybean meal from the United States. Therefore, when this problem was originally identified, the Brandon Research Station initiated new research to find a solution.

The work took several approaches. The first was to determine the best method of inoculating soybeans using commercially available inoculants. These products are developed in the United States and are intended for use in the corn and soybean belt of the Midwest. Experimental results at Brandon showed that placement of granular inoculum directly with the seed was superior to either soil-implant inoculation or the use of powdered inoculant as a seed coating. This method resulted in significant yield increases, and the beans contained more protein. However, high rates of inoculum were required, and nodulation was relatively late. On a commercial basis, results were not always consistent.

In other studies, the Brandon Research Station identified selected strains of *Rhizobium japonicum* that are effective nodulators and dinitrogen fixers with Group 000 soybeans under Manitoba's cool and short growing season. Some work is in progress to determine the effect of soil moisture and temperature on nodule development and dinitrogen fixation.

One of the objectives of Agriculture Canada's Research Branch is to identify new crop species and varieties that may be adapted to Canadian conditions and to assess these for possible commercial production. Therefore, the Brandon Research Station has cooperated over the years with other research stations, universities, and private industry in evaluating new pulses and oilseeds, such as lentils, fababeans, safflower, peas, and Tangier flatpea, for adaptability, yield, and other agronomic characteristics. As candidates are found for production in Manitoba, Brandon will proceed with work on crop management, fertilizer requirements, and weed control.

Wheat

Wheat has always been the most important crop grown on the Canadian prairies. The first testing of this cereal at Brandon occurred in the fall of 1888 when 184 lines of winter wheat were planted for observation. In the following year, 38 varieties of wheat were tested. As far as can be determined, these studies were conducted as single plots drilled in with a horse-drawn seeder. The first reasonably successful variety grown on the prairies was Red Fife.

Red Fife had good bread-making quality, but it was too late to be dependable. In order to solve this problem, the Department of Agriculture began to introduce earlier-maturing lines from Russia and India. However, most of them were not very useful because of poor yield or undesirable properties for milling and baking. As one of the original experimental farm sites, Brandon played an important role in the testing program as well as in the increase and distribution of seed of new varieties.

The experimental farm also evaluated selections from crosses made in Ottawa. This crossing and selection program paid off in a big way in 1907 with the release of Marquis hard red spring wheat. Marquis was derived from a cross between Hard Red Calcutta and Red Fife, and it remains today the standard to which all new hard red spring varieties are compared for flour quality.

However, Marquis was faulted on its susceptibility to stem rust discovered in the bad rust year of 1916. Brandon provided leadership in the study of this disease from 1916 to 1925. In terms of cultural practices, little could be done except to seed early and hope that the crop ripened before rust spores arrived in full force. Crop losses continued to be so severe that the federal government established the Dominion Rust Research Laboratory in Winnipeg in 1925 in an attempt to control the disease by breeding new varieties. The establishment of this research laboratory almost ensured that wheat breeding would eventually be transferred out of Brandon and replaced by work on variety evaluation and agronomy.

Crossing wheat, 1926.

A wheat-breeding program was initiated at the experimental farm in 1924 by S.J. Sigfusson and continued in earnest until his death in 1933, although lines were still being produced and tested into the early 1950s. Ceres wheat was introduced in 1924 and was eventually distributed in 1931. This variety showed superior rust resistance until it succumbed to new races in 1935. Sigfusson's work on cereal improvement did not produce any successful varieties because the selections proved to have a number of quality problems. Brandon 123 (also known as Great Northern in the United States) was the only line bred here that was cultivated to any extent on the prairies. The variety "escaped" from the farm and was quite popular among local grain growers. Although Brandon 123 had a high degree of rust resistance and good agronomic traits, its milling and baking properties were inferior. This wheat soon disappeared with the development of varieties like Thatcher, Renown, and Regent.

During the same period, variety evaluation took place not only at the Brandon Experimental Farm but also on numerous (as many as 18) illustration stations situated throughout Manitoba. These illustration stations were started in 1924 as outposts on privately owned farms. They operated according to a contract between the landowner and the superintendent at Brandon. Although most of the projects did not involve replication, they demonstrated the usefulness of good seed and good agronomic practices. From time to time, the illustration stations were called upon to increase stocks of the new varieties. For example, 3000 bu (109 000 L) of Regent wheat were grown and distributed in 1939, and 2000 bu (73 000 L) of Redman wheat were produced in 1946. The experimental farm's role in increasing and distributing pedigreed seed contributed to the early success of the wheat industry in western Canada. Today, the Research Branch of Agriculture Canada still maintains breeder seed of the new varieties. This seed is multiplied through the foundation, registered, and certified classes by pedigreed seed growers before being produced commercially. Each generation is inspected by government officials to ensure varietal purity and freedom from noxious weeds. The seed is also tested for germination. The Research Branch can thus concentrate its resources on developing varieties and agronomic practices rather than on producing seed.

Before 1900, much time was spent in answering some of the basic questions about growing wheat on the prairies. Numerous cultural tests were performed at Brandon. It was recommended to sow wheat at a rate of 1.5–2 bu/acre (1.3–1.8 hL/ha) with a drill that placed the seed in the ground and not on the soil surface. Fall seeding of spring wheat was attempted, but it was no more successful then than it is today. Many of the experiments ended after 5 years, but studies on the dates of seeding and the use of farm manure have been continued up to recent times. Delayed seeding was important in the control of wild oats until the 1960s, when herbicides came into general use. However, seeding after the 3rd week of May could be expected to result in significant yield reductions. This result is reasonable because selection for the grain quality of hard red spring wheat restricted the choice of parental lines that were used in crossing programs.

Before the introduction of Marquis, wheat varieties were late maturing. Farmers often tried to cut their fields on the green side to avoid frost. Experiments showed that serious losses in yield and grain quality occurred when the crop was swathed before the mid-to-hard dough stage. Recommendations have been refined over the years with changes in harvesting equipment, but the current practice of cutting at 35–40% kernel moisture is just slightly later.

Stem rust was not the only disease that plagued farmers. There were severe outbreaks of leaf rust and other leaf diseases. Wheat was also very susceptible to loose smut and covered smut or bunt. Early work demonstrated that smut control using blue stone was improved by doubling the rate of chemical from l lb (454 g) to 2 lb (908 g) for every 10 bu (363.7 L). The experimental farm was actively involved in developing

Table 2 Average performance of 4-year rotations "D" and "E" and 6-year rotations "G" and "H" on Assiniboine clay soil

Rotation	Yield per acre (bu or ton*)	Profit or loss per acre ($)
"D" (manured) summer fallow		−9.78
Wheat	32.29	18.06
Wheat	18.98	3.55
Oats	37.99	2.84
"E" (no manure) summer fallow		−9.55
Wheat	27.30	17.43
Wheat	15.40	3.38
Oats	31.79	3.05
"G" (corn-manured) silage	6.68	−0.38
Wheat	21.29	10.32
Hay	1.73	2.86
Hay and break	1.43	2.47
Wheat	23.17	8.83
Oats	48.37	7.24
"H" (fallow-manured) summer fallow		−9.32
Wheat	29.77	17.86
Hay	1.80	3.13
Hay and break	1.45	2.55
Wheat	24.66	9.90
Oats	47.89	8.32

*1 acre = 0.405 ha; bu for grain (1 bushel/acre = 0.899 hL/ha); ton for hay and silage (1 ton/acre = 2.24 t/ha)

Sheaves of wheat.

seed treatments to control the smut diseases. Currently, most varieties grown have genetic resistance to loose smut and bunt, and so they do not need to be treated. However, if seed treatment is necessary, the chemical industry has produced organic fungicides that are easier to use, safer, and more effective than either blue stone or mercury (the use of which was later popular).

Rotation studies began in 1895. Until 1910, a number of relatively short-term rotations were conducted to find a method of farming without bare summer fallow. The trials usually included some type of green-manure crop that was plowed down. In theory, this crop should maintain organic matter, reduce erosion, and control weeds. Unfortunately, the use of such rotations proved impractical as an alternative to summer fallow. To date, no one has yet developed a cropping system that is economically viable over a long period. In 1911, seven long-term rotations were established on large plots to determine the value of mixed farming. Four of these rotations were carried on until the late 1950s, when they were discontinued primarily because of weed control problems. A summary of the results from a 1957 report is presented in Table 2.

Testing of herbicides to control weeds in wheat became an important part of the Brandon Experimental Farm's work during the 1940s. Triallate, barban, diclofop methyl, and flamprop methyl for control of wild oats and 2,4-D for control of broad-leaved weeds are among the many herbicides that have been evaluated at Brandon with good results. These chemicals are in current use.

During the 1960s and 1970s, there was much concern that the protein content of hard red spring wheat was declining across the prairies. Part of this problem was attributed to reductions in soil organic matter and plant-available nitrogen. Soil degradation has recently been thought to be aggravated both by the use of summer fallow and by the cultivation of crops like sweet clover, flax, potatoes, sunflowers, corn, peas, and beans as substitutes for summer fallow. In tests at Brandon, the best net return was obtained with potatoes; wheat yielded equally well after sweet clover or fallow. As the area under summer fallow decreased in Manitoba, micro-organisms decomposing the straw were suspected of competing with the crop for nitrogen reserves in the soil. Research trials showed this to be a minor problem. Many farmers chose to burn their straw and chaff as a means of trash management. However, the combination of burning and fall tillage proved to be one of the poorest agronomic practices. It caused severe yield reductions.

Supplying additional nitrogen fertilizer is one method of increasing grain protein. A series of studies on the amount, time, and form of nitrogen application was initiated at Brandon in the early 1970s. This work demonstrated that splitting the nitrogen application between seeding time and appearance of the shot blade would cause a slight reduction in yield and an increase in grain protein. The protein content of wheat was also higher when the crop followed alfalfa rather than another cereal.

The Brandon Research Station no longer has an extensive wheat program. Research activities now concentrate on improving barley varieties and techniques for barley production. However, the early work with wheat was of incalculable value in testing and distributing new varieties, as well as in making cultural recommendations. Thanks to the accomplishments of the Experimental Farms Service, by 1915 the prairies were already shipping 150 million bu (5455 million L) of wheat each year out to eastern Canada and overseas markets.

CHAPTER 4
Management

Crop rotations

In a report of 1893, Superintendent Bedford commented on cropping practices common to the newly settled areas of western Manitoba:

At present very few farmers in this country practise a rotation of crops, many following wheat with wheat until the land is so impoverished or made foul with weeds, that less than half a crop is obtained... As this system, or rather want of system, will have to be changed before many years, some experiments were undertaken this year for the purpose of throwing light on the proper rotation for this country.

The Brandon Experimental Farm began a series of experiments in 1893 to compare yields of Red Fife wheat grown under two different cropping systems: on stubble fields of barley, fodder corn, millet, peas, or oats that were plowed in the spring; or on summer-fallow fields with no spring preparation. Preliminary results indicated that wheat yields were higher after fodder corn or millet than they were after barley, peas, oats, or summer fallow.

In the early 1900s, the need for weed control led to the adoption of what was known as the Manitoba grain rotation. This 4-year cropping sequence of summer fallow, wheat, wheat, and coarse grain was practised by most of the farmers in the region for many years. Unfortunately, weed problems were steadily increasing throughout the province. As a result, Brandon developed a 3-year rotation that alternated summer fallow, wheat, and coarse grain. By 1915, this rotation essentially replaced the former.

The trend toward a 2-year rotation appeared by 1940. Grain farmers preferred to follow a cropping sequence of summer fallow and grain. This change was generally attributed to the advent of the mobile thresher combine. Straw and chaff from the combine made the preparation of land for seeding more difficult. Crop residues had to be removed or chopped and evenly spread. However, trash management also increased the distribution of weed seeds, such as wild oats.

Of the land under crop production in Manitoba, 12% was summer-fallowed in 1915 compared with 28% in 1952. This increase developed despite the introduction of summer-fallow substitute crops (like corn, sunflowers, and sugar beets) into the south central part of the province. During the same period, research trials demonstrated the value of commercial fertilizers and herbicides in more intensive cropping systems.

The Brandon Experimental Farm made numerous recommendations on new crops and varieties for the area, as well as on improved agronomic practices for weed control and soil conservation. Grasses and legumes were important in rotations since they could effectively compete with weeds like wild oats. Furthermore, forage crops would serve to increase soil fertility and economic returns. Rotations were planned to suit the needs of grain and livestock producers. Many farms and illustration stations adopted cereal-forage rotations of 4-, 6-, or 8-years' duration. Each included 1 year of summer fallow. In the 1930s and 1940s, assistance with field design and cropping sequence was provided for approximately 600 farms that varied in size from a quarter section (64.8 ha) to 10 quarter-sections (648 ha).

During the 1960s, 3-year rotations that alternated wheat, wheat, and a substitute crop for summer fallow (such as potatoes, clover hay, oat hay, silage corn, or flax) gave better results than a cropping sequence of wheat, wheat, and summer fallow. Experiments in the 1980s showed that barley yields were higher after plowing down fababeans or soybeans as green manure than after summer-fallowing. When the legumes were harvested for grain, nitrogen fertilizer at a rate of 60 kg/ha was required to bring the yields of barley up to those obtained on summer-fallow fields.

Soil fertility and management

Soil fertility Soil fertility research at Brandon started in the early 1890s because many prairie farmers then thought that application of animal manure to soil was bad for crop production. It was perceived to cause rank growth and to delay crop maturity. However, the experimental farm showed that fresh manure applied at 20 tons/acre (44.8 t/ha) actually hastened the maturity of wheat and produced a significant increase in yield. Experiments on the method, time, and rate of application of animal manure for cereal crop production were the mainstay of soil fertility research at Brandon for over 30 years. This work was expanded to include corn in 1911, as well as potatoes and sunflowers in 1923.

The early 1890s also saw the first recorded results from superphosphate trials on wheat. The beneficial effects of inoculating clover with soil that contained nitrogen-fixing bacteria produced a threefold increase in crop yields. Work with nitrogen, phosphorus, and potassium fertilizers started at the turn of the century. Until the 1920s, there was no testing to assess the nutrient status of soils. All fertilizers were applied broadcast, and experimental treatments were not replicated. Despite these limitations, the experimental farm demonstrated the need for balanced applications of nitrogen, phosphorus, and potassium fertilizers for cereal and corn production. Corn, root crops, and forages were found to have a much higher nitrogen requirement than cereal crops.

After 1910, research was undertaken to examine how soil productivity and crop yield were affected by green and animal manures, commercial fertilizers, and crop rotations. Soil productivity was known to be influenced by the amount of plant food consumed by a crop and the amount left for subsequent crops, by the amount of humus returned to the soil, and by the reserves of soil moisture at spring seeding. The yields of wheat after summer fallow (with or without animal manure) were higher than those after green manure with peas or clover. The green-manure crop took moisture that would otherwise be stored in the soil under bare summer fallow. A 1- or 2-year hay or pasture crop provided better soil tilth and nutrient levels than bare summer fallow. However, under Manitoba conditions, growing these forages often resulted in appreciably lower yields in the subsequent wheat crop. Lack of soil

moisture also severely limited yield response to manure and commercial-fertilizer treatments in dry years.

After 1932, research was conducted more along the lines used today. Replicated small, rod-row plots, 16.5 ft (5.0 m) long, were substituted for the nonreplicated large plots of one-tenth of an acre (0.04 ha).

The next 15 years saw the start of more detailed studies on how different cultural practices affected the yield response of wheat and barley to phosphate fertilizers placed with the seed. Experimental results established several important crop- and fertilizer-management principles that are still valid. After the latter part of May, cereal yield and the response to fertilizer decline with further delays in seeding. Fertilizer application rates must be tailored to match the available nutrient status of the soils, as well as the crop requirements. Furthermore, in dry years, the early response to fertilizer frequently disappears as the season advances and drought sets in. Monoammonium phosphate (11-48-0) is a better fertilizer than superphosphate for promoting crop yield.

A 12-year study was started in 1940 to compare the relative value of animal and green (sweet clover) manures as well as commercial fertilizers for wheat and corn production on a light sandy soil. Commercial fertilizers, such as 11-48-0 at 40 lb/acre (44.8 kg/ha) or 16-20-0 at 60 lb/acre (67.2 kg/ha), profitably increased yields of wheat and corn. However, as in previous green-manure studies, sweet clover (when plowed down) depressed rather than increased yields. On the other hand, the application of 12 tons/acre (10.9 t/ha) of animal manure every 4 years steadily increased yields over the entire period. This result contrasted with declining yields where no manure or fertilizer was applied.

Researchers at Brandon also found that crop yield and the response to fertilizer frequently varied more within fields than between fields or soil associations. This was attributed to localized differences in the natural fertility and moisture regime of Manitoba soils. Other similar studies showed that difficulties in growing crops on saline soils, a widespread problem throughout the prairies, were due more to the low natural fertility of these soils than to the direct effects of their high soluble-salt content.

Activities in the mid 1950s contributed significantly to the development of procedures for testing the amounts of nutrients available in the soil. This work led to the fertilizer recommendations used today by the Manitoba Provincial Soil Testing Laboratory. Early studies identified the amount of available nitrogen (nitrate-nitrogen) in the soil in the spring as being the main factor responsible for the differences in crop yields achieved with the various systems for managing the cropping sequence and crop residues. Early results also threw serious doubt on the value of summer-fallowing as a means of increasing crop yields by increasing the available nitrogen in the soil for the next crop. Related research showed that under Manitoba conditions, only 38% of the rainfall was used for crop production under a wheat–fallow system versus 80% for continuous wheat. This inefficient use of rainfall was therefore thought likely to increase soil erosion and the subsequent loss of soluble, plant-available nutrients through leaching. Furthermore, drainage and salinity problems would probably increase on poorly drained soils. Most agronomists and farmers now realize that summer-fallowing is directly responsible for widespread soil erosion by wind and water, as well as for increases in soil salinity.

A break with traditional thinking about the apparent fixation or loss of fertilizer phosphorus not used by a crop in the year of application came from research started in the late 1950s. This work showed that the application every year of phosphate fertilizer at recommended rates progressively increased the level of phosphorus available to plants in the soil. The pattern of root distribution, soil moisture conditions, and the texture and carbonate content of the soil were also found to affect crop uptake of applied phosphorus. Subsequent research was undertaken on the availability of residual phosphorus in the soil and on ways to improve methods of applying phosphorus to various crops. The results have had a major impact on the development of new technology and recommendations for the application of phosphorus, particularly in the oilseed and protein crops. For instance, on phosphorus-deficient soils, banding the fertilizer 2.5 cm below or beside the seed row gave large increases in yield for flax, a crop that hitherto had been thought to be unresponsive to applied phosphorus.

above

B.J. Gorby, measuring the salt content of ground water in 1962

below

M.W.M. Leo, recording data in a study of water uptake and salt movement.

opposite page

Leveling sand strips caused by soil drifting, 1936

Many Manitoba soils are deficient not only in nitrogen and phosphorus but also in potassium and sulfur. Work was started in the early 1960s to identify soil types and critical levels of available potassium in areas where cereal, oilseed, and forage crops showed economic increases in yield in response to potassium fertilizer. On soils deficient in both nitrogen and potassium, tests showed that the crop requirements for potassium had to be satisfied first by potassium fertilization before a yield response to nitrogen fertilizer could be obtained. Sulfur fertility research started in the early 1970s. The first problem under study was the development of a reliable way to measure the levels of sulfate, which is the form of sulfur used by plants, in the soil. Subsequent research demonstrated the importance of applying sulfur fertilizer for a wide range of crops, including legumes and corn.

Over the years, research at Brandon has been adapted so that new questions concerning the introduction of new crops (such as soybeans, flax, and sorghum) and new forms of fertilizers (like urea, anhydrous ammonia, and polyphosphates) can be answered. Scientists have sought to refine and improve the technology of fertilizer use so that crop yields and fertilizer efficiency are maximized. Many plant-nutrient deficiencies or imbalances that are likely to restrict crop growth have thus been identified and corrected. For instance, heavy use of phosphate fertilizers has caused another potential nutrient problem in flax, that of zinc deficiency. In attempts to improve the fertilizer efficiency and crop response to applied nitrogen, the dosage was split over various stages of crop growth and the effect of banding rather than broadcasting the nitrogen was evaluated. Surveys of the nutrient status of corn in Manitoba revealed that up to 20% of the production area may be deficient in sulfur, and up to 10% may be deficient in zinc. Research is now in progress to determine the soil and crop requirements for sulfur and zinc fertilization. Other research is ongoing into the problem of low crop yields on soils high in magnesium, a problem peculiar to many Manitoba soils.

In 1984, a multi-site experiment was started on barley and wheat. The aim was to determine the nitrogen requirements and yield potential for different varieties under a range of soil and climatic conditions that typify the major areas of production of these crops in Manitoba. The newly introduced semidwarf or 3M wheats from the United States are included, as well as the Canadian entry, HY320. Studies to maximize the yields of wheat, barley, and canola in the province have also recently been started.

Soil management The Brandon Experimental Farm was ideally located for the first studies in soil management. About two-thirds of the farm is situated in the Assiniboine Valley on a soil classified as an Assiniboine complex. This deep, rich, black calcareous clay loam has poor to moderate drainage. It comprises several soil types typical of most of the better land under cultivation in western Manitoba. Unfortunately, the pioneer farmers found this soil difficult to work. In dry years, the soil was hard and resisted cultivation. In wet years, it was stiff and tenacious; crops were often "mucked in" rather than planted at seeding time. If left unprotected, the soil suffered from erosion by both wind and water.

Soils on the slope of the Assiniboine Valley and the coulees are well-drained. They were cropped to permanent pasture and trees because of the high incidence of water erosion. On the higher level, the soil is shallow and sandy. The subsoil is gravel, which frequently comes to the surface. This portion of the farm characterizes the less fertile and erodible lands in the province.

Shortly after the experimental farm was established, shelterbelts were planted to protect the land from wind erosion. Other experiments included a comparison of methods for preparing stubble land for grain production, such as plowing, disking, or burning and disking; a comparison of equipment for seeding, such as a single disk, a hoe drill, a shoe drill, a press drill, or a broadcast machine; development of methods for increasing soil productivity with bare fallow, green manure, and barnyard manure; and an investigation into methods for improving seed emergence by packing and rolling farmland.

In 1897, the first work designed specifically to control soil drifting was undertaken. Long-term rotation studies began in 1910 and continued until 1965. Included among the cultural experiments were investigations into soil packing, depth of plowing, surface tillage versus plowing, methods of breaking sod, and seedbed preparation.

Unfortunately, soil management was looked upon as a costly item. Fall and spring cultivations were thus encouraged. Bare fallow was publicized as being superior in increasing wheat yield to the use of green manure. Plowing to break up the soil was an accepted practice. Most farmers cultivated their fields several times to smooth the seedbed in spring and to blacken the summer fallow in midsummer.

Between 1934 and 1940, western agriculture suffered the combined effects of low prices for farm produce, drought, insects, plant diseases, and mismanagement of the soil. At Brandon, the great challenge of its research officers in field husbandry was to slow down the rate of topsoil loss. Work was initiated to prevent soil drifting and to develop technology for the production of drought-tolerant crops, such as corn, sunflowers, grasses, and legumes. The experimental farm advocated the use of green manure. It discouraged the burning of straw and chaff. Protection of the soil with crop residues was considered essential to soil management. Experimental substations (such as the Melita Reclamation Station) and illustration stations demonstrated methods for reestablishing crops, arresting soil drifting, instituting strip farming, leaving adequate trash cover, planning shelterbelts, and managing farmland under adverse conditions.

Brandon provided effective leadership in soil conservation research at that time and continues to do so today. Studies are under way in zero, minimum, and conventional tillage, rotations with green-manure crops, and the use of specialized equipment that has a minimum pulverizing effect on the soil.

The Pasquia project In 1960, the Brandon Experimental Farm began a study on the management of saline soils within the Pasquia land settlement project. This project was situated in an area between the Carrot and Pasquia rivers, extending from The Pas westward about 30 km to the Saskatchewan border. It was established following provincial reconnaissance soil surveys in 1946 and 1949. The Canada–Manitoba Agreement of 1953 authorized the reclamation of this area, which included marsh and swamp, into potentially productive farmland. In cooperation with the Manitoba Department of Mines and Natural Resources, the Prairie Farm Rehabilitation Administration constructed a number of dykes and canals. The region was resurveyed in 1958. There was estimated to be about 40 000 ha of arable land, mainly alluvial deposits that ranged in texture from fine sand to clay with varying depths of peat. However, successful agricultural production would be hindered by such problems as imperfect drainage, salinity, low fertility, weeds, and the risk of wind erosion.

In the fall of 1960, an experiment on the management of saline soils (the Pasquia project) was begun on a representative problem site. Yields of wheat were found to vary with levels of salinity and organic matter in the soil. There appeared to be no correlation between these two factors.

Six grain and forage rotations were conducted from 1961 to 1964. Relatively high rates of fertilizer on cereals and forage crops gave good returns. Results with continuous wheat were better that those with wheat grown on summer fallow. Different cropping sequences, including those with forage, produced similar effects on soil salinity. A decrease in salinity was recorded, mainly within the top 10 cm of soil. Herbicides were used to control weeds, and minimum tillage practices were adopted to reduce the risk of erosion.

Weed control

The importance of weed control for crop production was recognized soon after the experimental farm was established at Brandon. Early control measures depended mainly on cropping and tillage practices. Experiments were undertaken to evaluate the benefits of planting late, seeding heavy rates, tilling the soil prior to crop emergence, and applying fertilizer.

In 1925, the Manitoba Weed Commission was established. This commission comprised former Superintendent S.A. Bedford, Professor T.J. Morrison from the Manitoba Agricultural College, and George Batho from the Provincial Department of Agriculture. They initiated many research and extension activities, including the development of control measures and weed exhibits, an essay competition and program on weed identification in schools, and an annual conference on work with weeds at Brandon.

Experiments in the use of chemicals to eradicate weeds began in the 1920s. Results from these trials contributed to the recommendation and use of many herbicides in the province. Based on work at the Brandon Experimental Farm, the Manitoba Weed Commission set up numerous farm demonstrations of contact herbicides, such as sodium chlorate, formite, raphanite, Alsask Nonpoisonous Weed Killer, Atlacide, and Stoldt's Weed Killer. Atlacide was used extensively to control leafy spurge and hoary cress. Two sprayer rigs were engaged to go out into the municipalities and apply this chemical to infested areas within farm fields. As reported in 1937, complete eradication was obtained with two applications, one in June and another in September, at rates of 450–500 lb acre (504–560 kg ha) using 1 gal (4.5 L) of water to every pound (454 g) of Atlacide. The herbicide proved useful in controlling small patches of these weeds, but the cost of application became prohibitive. Furthermore, Atlacide was found to sterilize the soil, preventing subsequent crop production for up to 5 years.

During World War II, the herbicidal properties of the phenoxyacetic acid derivatives were studied under cover of military secrecy, both in England and in the United States. Weed science entered into a new era after 1945 with the development of selective and nonsterilizing herbicides, such as 2,4-D and MCPA. Formulations of these herbicides applied at relatively low rates were successful in controlling annual

R.D. Dryden, inspecting a new plot sprayer in 1961.

and perennial broad-leaved weeds in cereals and flax. Recommendations for the use of 2,4-D and MCPA in cereals and flax were soon established by the research committee of the North Central Weed Control Conference, of which the Brandon Experimental Farm was a member.

Wild oats have been the subject of research at Brandon since the turn of the century. Experiments on their control were expanded in the early 1950s under the direction of D.A. (Dave) Brown, a research officer in field husbandry. In a 1953 survey, the experimental farm questioned 580 farmers in western Manitoba about the distribution and density of problem weeds in the region. Wild oats were ranked as the most troublesome in 95% of the replies. Samples of wild oat seeds were collected the same year and tested for germination. Results supported the theory that lengthy but variable periods of afterripening were necessary before the seeds germinated. The breaking of this delayed-dormancy characteristic was hastened by subjecting the seeds to warm and dry conditions. When seeds were stored in cool, damp soil from the time they dropped off the panicle or flower head, they remained dormant at least through the autumn months. Frequently, many of the seeds could survive in the soil for up to 14 years and then germinate.

Continuous cropping of cereal grains was practised by most farmers in the province at that time. Unfortunately, this system made it more difficult to combat wild oats. Work at Brandon indicated that the best cultural control measures involved delayed seeding of an early-maturing crop (such as barley); cultivation of the soil surface, after seeding, with a rod weeder or harrows; careful management of summer fallow; and the use of fall rye in crop rotations. Forage grasses and legumes proved most effective against wild oats, when included in a cropping sequence for a minimum of 2 years.

Since the late 1940s, several new herbicides were developed for cereal crop production. Infestations of wild millet, also known as green foxtail, had become widespread by 1948. This annual grassy weed was considered to be a serious economic problem in Manitoba. The use of TCA was licensed for wild millet control. Tank mixes of TCA and various phenoxy herbicides were also approved to control a wide range of grassy and broad-leaved weeds. There were no products that showed activity on wild oats until screening tests during the 1950s and 1960s found three potential candidates. Brandon participated in the field evaluation of Carbyne applied after crop emergence and Avadex and Avadex BW applied as soil-incorporated treatments. Results supported the registration and recommendation of these herbicides for control of wild oats in cereals, flax, and other field crops.

By the late 1960s, a number of dinitroaniline herbicides were being tested as soil-incorporated treatments. Only Treflan proved successful in controlling a broad spectrum of weeds in rapeseed (including canola). It would be used extensively as rapeseed became a major oilseed crop on the prairies.

With the appointment of P.N.P. (Paul) Chow in 1968, the Brandon Research Station initiated work on the physiology of weeds. These studies were directed toward problems with herbicide application in the field. Using radioactive techniques in the laboratory and greenhouse, Chow began to investigate the mode of action of different herbicides in plants as well as in the soil.

Weed research was expanded to many other field crops besides cereals, flax, and rapeseed. R.D. (Dick) Dryden, whose first efforts in agronomy and weed control at Brandon started in 1960, developed a new program in 1970 to assess cultural and chemical control measures for corn. Bladex, Eptam, Lasso, and Sutan were found to be effective products in crop rotations. Herbicide evaluation would later be undertaken for sorghum, forages, potatoes, beans, lathyrus, and lupins.

Modern equipment for spraying plots.

Other experiments during the 1970s looked at adding herbicides, such as Avadex BW and Treflan, to fertilizers. The mixtures could be applied in a single operation, thereby reducing farm costs and labor. Combinations of different herbicides and insecticides were assessed to broaden the spectrum of pest control in new and established crops. Because the control of wild oats was important for crop production on the prairies, considerable attention was also paid to developing several new wild oat herbicides. Field research at Brandon has supported the registration of many products, including Asulox F, Avenge, Hoe-Grass, Fusilade, and Poast.

Concerns over pesticide pollution and the high cost of new herbicides have led to current research on the use of adjuvants. Adjuvants are surfactants and inorganic salts that may be added to herbicides in order to improve their activity on weeds. In studies that mixed appropriate surfactants with Hoe-Grass, Roundup, or Poast, for example, the research station found that the recommended rate of applied herbicide could be reduced while the same degree of weed control was maintained. More research and exchange of scientific information is necessary before the potential benefits are realized. To promote new development initiatives, the First International Symposium on Adjuvants for Agrochemicals has been planned for Brandon in August 1986.

CHAPTER 5
Organization

Experimental substations

Reclamation at Melita Under provisions of the *Prairie Farm Rehabilitation Act*, a reclamation substation was established in southwestern Manitoba in the autumn of 1935. The act had been passed earlier that year to explore means of rehabilitating agriculture in the Prairie Provinces. Vast areas had suffered acutely from the combined effects of drought, grasshoppers, wind erosion, and general economic depression.

M.J. Tinline, superintendent of the Brandon Experimental Farm from 1925 to 1946, selected the site on two sections (518 ha) of rented land near the town of Melita. The legal description of the location was N 19-4-26 W1, S 30-4-26 W1, and 29-4-26 W1. Until the substation closed in 1959, operations were directed from Brandon. Officers in charge of the experimental work were H.A. Craig, 1937; A.J. Strachan, 1938–1941; W.H. Nelson, 1942–1945; F.S. Gugin, 1946–1949; W.K. Dawley, 1950–1955; and R.D. (Dick) Dryden, 1957–1959. J.V. Parker was responsible for general supervision of the substation from 1935 until 1959.

The immediate objectives of the Melita Substation were to prevent further damage to the sandy soils of the Souris River region by drought and wind erosion, to reclaim the land for agricultural production if possible, and to study cultural methods and cropping practices that would prevent or limit wind erosion in the future.

The substation represented an extensive area that had been severely eroded by wind. In some fields, soil drifting had removed wide strips of topsoil up to 30 cm in depth. Fence rows were banked with drift soil, and blown-out areas were transformed into sloughs when heavy rains fell. Weeds invaded abandoned farmland. However, quack grass saved many fields from complete destruction. Experimental projects were begun to determine methods of reclaiming eroded land for agricultural production.

Melita conducted several studies on soil renovation, fertility, and conservation. Initial work looked at leveling and stabilizing drift soil by seeding fall rye, grasses, and leguminous crops. The application of barnyard manure or chemical fertilizer on eroded areas improved cereal and forage yields. Crop-sequence studies lasting 2–8 years were begun on a field scale. The use of summer fallow was discouraged as much as possible. One project measured the productivity and monetary returns from cereals and forages in crop rotations. Increasing the amount of forages in crop rotations was found to be beneficial.

In its attempt to improve methods of fighting wind erosion, the substation evaluated a number of tillage and cropping practices. It was important to protect the surface layer of soil in summer-fallowed fields with crop or weed residues. A minimum number of tillage operations with blade cultivators was recommended until the middle of September. The application of herbicides and timely cultivation controlled a wide range of annual and perennial weeds, including quack grass. Herbicides could be sprayed on summer fallow, in crops, or after harvest. These practices furnished adequate trash cover. As well, there were projects to investigate the seeding of cereal cover crops on summer fallow in August, strip cropping, and the establishment of field shelterbelts.

above

Reclamation of badly eroded soils proceeded at Melita.

Other work was undertaken on the control of weeds and insects, dates and methods of seeding, methods of handling combine residue, performance of farm machinery, production of hay and pasture, and maintenance of feed reserves. Varieties and strains of many crops were tested for regional adaptability.

In 1941, a portion of the Shorthorn cattle herd at the Brandon Experimental Farm was transferred to Melita. The cattle project, comprising 78 animals in 1947, helped to demonstrate the value of mixed farming on the light-textured soils of southwestern Manitoba.

Special crops at Portage la Prairie The Brandon Experimental Farm directed operations at the Special Crops Substation in Portage la Prairie from 1955 to 1959. Subsequently, these responsibilities were transferred to Morden. The substation, originally known as the Pilot Flax Mill, was established in 1944 on 28 ha of land under the supervision of the Fiber Division in Ottawa. In 1953, the Fiber Division amalgamated with the Division of Field Husbandry, Soils, and Agricultural Engineering.

The demand for fiber flax declined after World War II, and work with this crop was reduced. In 1956, studies began on oil flax and other special crops that were of increasing importance, especially in the eastern portion of the province.

Tests were carried out to evaluate varieties of flax, rapeseed, soybeans, sugar beets, sunflowers, field peas, white beans, and vegetables. The substation was also involved in cooperative variety trials with cereal crops. One experiment on oil flax agronomy compared various dates of seeding.

Other work was undertaken with herbicides and fertilizers. Applications of TCA, MCPA, and 2,4-D on field peas and flax, and TCA with CIPC on sugar beets, were assessed for their degree of weed control. The substation looked at the value of nitrogen and phosphorus fertilizers for field peas, oats, rapeseed, and sugar beets grown on summer fallow or stubble land.

A 3-year crop sequence study was begun in 1956 with barley, wheat, buckwheat, field peas, soybeans, flax, rapeseed, sunflowers, corn, and sugar beets.

During the 5 years of operations at Portage la Prairie, research programs were supervised by the officer in charge, E.M. MacKey, and an agricultural chemist, W.O. Chubb.

Soils and crops at Wabowden Geological findings from the turn of the century and soil surveys during the 1950s describe a clay belt of 3 million ha in the Upper Nelson River basin of northern Manitoba. About one-fifth of the area was reputed to be arable land with some potential for agricultural production. A soil survey report of 1952, preliminary work from 1925 to 1930 by supervisors of the illustration stations associated with the Brandon Experimental Farm, and favorable comments on growing various crops from local residents all led to the recommendation that experimental work should be expanded in the region.

left

Producing fiber from flax straw at Portage la Prairie.

opposite page

Illustration station operators, 1930.

In 1953, the Department of Agriculture approved the establishment of an experimental substation. The substation was built in 1954 approximately 2.4 km west of Wabowden at Mile 137 on the Hudson Bay Railway, 220 km northeast of The Pas. A more detailed soil survey conducted in 1957 confirmed the need for experimental work on the Gray Wooded soils of this northern area, where the climate limits the kinds of crops that can be grown successfully.

Operations at Wabowden began in 1955 and continued until 1965. In 1957, the substation consisted of 98 ha of land with 18 ha under cultivation. The officers in charge of the substation were V.W. Bjarnason from May 1955 to February 1957 and P. (Peter) Braun from May 1957 to October 1965.

There were two main areas of research at Wabowden. Tests were carried out to evaluate varieties and strains of many crops for adaptability, including wheat, barley, oats, corn, flax, and rapeseed. Alfalfa, red clover, sweet clover, and forage grasses were assessed for feed or seed production. Most hardy vegetables, root crops, and potatoes gave good results when appropriate levels of fertilizer were used. Bush fruit and ornamental shrubs were grown successfully. Weeds were only a minor problem.

Other work included studies on nutrient deficiencies in the field and on various methods of breaking, tilling, and managing the soil. There were experiments on land clearing, drainage, the value of organic matter in the form of peat, and the use of commercial fertilizer for barley and potatoes. The substation looked at the returns from fertilizer on alfalfa, red clover, forage grasses, and mixtures of bromegrass and alfalfa. Crop-sequence studies with alfalfa, sweet clover, bromegrass, and peat measured the effects on barley yield.

Clearing and draining land were important factors in the establishment of crop production areas, and the substation sought to develop good management practices. For example, land should be cleared in winter rather than in summer to conserve the organic matter. Fertilization with nitrogen and phosphorus was recommended for most crops. The application of peat was also beneficial.

In its appraisal of the agricultural possibilities in northern Manitoba, the Wabowden Substation considered other potential enterprises, such as the production of beef and dairy cattle.

Illustration stations

The Division of Illustration Stations was established in Alberta and Saskatchewan in 1915 and expanded to Manitoba in 1924. Its objectives were to introduce, demonstrate, and evaluate new technology in crop production on private farms. These sites were known as illustration stations or district experiment substations. They were located in regions served by each experimental farm. Projects were to be carried out by the cooperators under the direction of an agricultural officer.

Seven illustration stations were operated out of Brandon in 1924. Work began in Manitoba at Dauphin, Gunton, Magnet, and Shergrove, and in eastern Saskatchewan at Churchbridge, Kamsack, and Wawota. J.D. Guild served as the first supervisor until 1927. He was succeeded by D.A. (Dave) Brown in 1928–1934, A.W. Wilton in 1934–1943, J. (John) Bowland in 1945–1946, D.J. MacDonald in 1946–1949, B.J. (Bonar) Gorby in 1947–1959, and D.A. Duncan in 1948–1957.

During Guild's tenure, the number of illustration stations in Manitoba grew. Six new farms were added in 1925 at Arborg, Dugald, Inwood, Petersfield, Plumas, and Ste. Rose du Lac, while the Shergrove site was abandoned when the cooperator retired. Other illustration stations were established during subsequent years at

Ashern, Beausejour, Deloraine, Durban, Eriksdale, Gilbert Plains, Grandview, Hargrave, Katrime, Kenville, Lenswood, Morris, The Pas, Roblin, Silverton, and Swan River. Two more locations were selected in eastern Saskatchewan at Tisdale in 1927 and at Pelly in 1929. Farms at Dryden and Emo in northwestern Ontario became part of the program in 1930. Activities at the illustration stations in Saskatchewan and Ontario continued until 1933.

From 1935 to 1938, five district experiment substations were established in Manitoba under provisions of the *Prairie Farm Rehabilitation Act* for the purpose of improving conditions on croplands stricken with drought and soil erosion. They were situated at Boissevain, Crystal City, Goodlands, Lyleton, and Pipestone.

In addition, cooperative experiments on various field and garden crops were conducted from 1925 to 1930 at Hudson Bay Junction in Saskatchewan and at several locations along the Hudson Bay Railway in Manitoba: The Pas, Mile 42 (Cormorant), Mile 81, Mile 82, Mile 137 (Wabowden), Mile 185 (Thicket Portage), Mile 214 (Pickwitonei), Mile 237 (Arnot), Mile 279, Mile 327 (Gillam), and Churchill. Other sites in the province included Port Nelson on Hudson Bay, as well as Wanless and Sherritt Junction near Flin Flon.

Many projects supervised by the Brandon Experimental Farm were continued for years, 20 or more on some illustration stations. Therefore, over time this program covered a wide range of climate, crop, and soil conditions, as well as farm-machine technology. Variations in crop production were recorded as a result of such factors as drought, frost, soil erosion, weeds, insects, and diseases. For example, southwestern Manitoba experienced severe drought, stem rust, and grasshoppers in the 1930s. The illustration station program helped to rehabilitate most of the farmers whose resources were seriously eroded during those difficult years.

Work at the illustration stations contributed to important changes in agriculture within each region. Projects such as the testing of new crops and varieties for local adaptability had a major impact. Demonstrations of soil conservation measures, field shelterbelts, strip cropping, cover crops, trash cover, and improved tillage practices for the control of weeds and soil erosion were all equally important. Crop rotations that emphasized more forage and less summer fallow were adopted on many farms. Producers were especially interested in the use of commercial fertilizers and maintenance of soil fertility. The illustration stations also provided assistance with farmstead planning and livestock management. They maintained long-term records on crop yields, costs of production, and farm incomes to assess soil productivity for individual fields. Other important activities included extension education and regular field days as a means of communicating experimental results.

On 1 April 1959, the Division of Illustration Stations was revised and decentralized. Direct supervision was transferred to the Department of Agriculture's Research Branch. The illustration stations then became known as experimental project farms. They continued to serve as an important outlet for demonstrating new research and conducting special studies under particular local conditions. For example, the Pasquia project was undertaken at The Pas from 1960 to 1964 to examine the effect of cropping on salinization, organic matter, nitrogen content, and physical condition of newly drained alluvial soils.

Social events

Until 1953, there was no formal social club at the Brandon Experimental Farm. Special events were arranged spontaneously by interested individuals. Many outdoor activities were organized by the young people who lived on the farm and their guests from town. The Churchers, Tinlines, and Campbells were avid participants. Good use was made of the lawn tennis court, east of the present horticultural greenhouse.

During the summer, many a Saturday or Sunday afternoon would see an energetic group heading for a picnic lunch at Ten Mile Dam, which was located immediately west of the experimental farm on the Little Saskatchewan River. On these outings, staff members enjoyed various means of transportation. Some rode bicycles, and others piled into the rumble seat of B. (Bruce) Martin's car, which he drove on rationed gas during the war years. The more adventuresome would hitch their bicycles to Martin's roadster, using ropes on temporary loan from the cattle barns. Mishaps would often occur on the way to Ten Mile Dam, but everyone had lots of fun.

At the picnic site, teams formed for baseball, dodgeball, stone throwing, and river dunking. Another exciting game was the bicycle race down a bank of the Little Saskatchewan. The object here was to pedal toward the river as fast as possible and then apply the brakes just at the water's edge. Quieter times were for singsongs accompanied by violins, guitars, and even a mandolin. In 1944, the Nyquist sisters from Erickson joined the group and added to the entertainment by singing songs in English and Swedish.

Christmas parties, retirement functions, and other social events were held in a rented building or the Indian Residential School nearby. When new offices were constructed at the farm in 1950, the provision of an auditorium was approved for these activities. The auditorium was situated where the computer facilities, lunchroom, and storage areas are in the present administration building. R.M. Hopper, superintendent of the Brandon Experimental Farm from 1946 to 1960, had a complete set of china ordered for use on such occasions. Food for the Christmas parties was donated by families in residence. Many other staff members offered their talents to provide entertainment. They made up comical skits, sang songs, and played musical instruments.

above
Field day at Brandon, 1938.

below
75th Anniversary celebrations, 1962.

The organization of a social club in 1953 consolidated the informal liaison among employees. The first order of business was arranging terms of reference for the constitution. A provision allowed for amendments to be made at any future date by holding a referendum. Members were elected to an executive committee for one term only, and they were given different areas of responsibility in planning each social event. The reelection of officers was strictly prohibited in order to encourage participation by everyone on staff. All permanent employees paid annual fees to cover expenses. The social club decided it should hire caterers for special functions and not rely on donations of food from the staff members. Another recommendation made was to rent a Santa Claus suit for the annual children's Christmas party. This practice continued for several years, until rental charges became too expensive. A seamstress was then commissioned to make up a suit. Employees would regularly borrow the costume to highlight their own festivities at home.

The social club established a piano fund in the late 1950s. For those who entertained at special events on the farm, musical accompaniment was always welcome. However, it became more and more costly to rent a piano and there was the constant worry of how to transport it safely. The executive committee decided to save part of the money collected from the membership to purchase one. As well, I.H. (Ivy) Reed contributed a percentage from her sales of Regal products. All donations were gratefully received. Unfortunately, the social club never did buy the piano. When the fund was half way to its goal, the money was diverted to other activities.

The 75th Anniversary of the experimental farm was held on 18 July 1962. There was an open house with approximately 1000 people in attendance. Various events included guided bus tours of the land and buildings, displays of laboratory and field equipment, a special program for the ladies, guest speakers, and lectures by the department heads on their current work. This was a great opportunity for the residents of Brandon and the surrounding area to see and hear about the activities at the experimental farm.

In the 1960s and 1970s, there were many retirement dinners and barbeques held at rented halls or on the lawns of the research station. These functions always included the presentation of a gift to the retiree, in acknowledgment of his years of service.

During the same period, the social club organized several sporting events. One of the first was bowling. There were two teams from the research station pitted against players from the town league. The social club even contributed some of the prizes.

Children's annual Christmas party, 1964.

In 1969, G.W. (Gunther) Rahnefeld, C.H. (Charlie) Waldon, and J. (John) Stobbe started up a skating rink for their children just south of the caragana hedge near the front offices. This led to the formation of a staff broomball league, which included local farmers and veterinarians besides the players from the station. There were four teams with eight members per team. The games were played after hours, and they seemed to release all the pent-up frustration and energy from a day's work. Even the meekest fellows were seen checking others against the boards. A small warming hut was pulled to the ice and a wood stove was installed. The league lasted three winters before it disbanded. Several members then joined a city broomball league.

In the late 1970s, the social club evolved into its present structure. Amendments to the constitution clarified some vague terms of reference. Collections would be made for an employee on the occasion of a wedding, birth, death of a family member, hospitalization, farewell, or retirement. Plants and vegetables were sold to subsidize social functions so that the club could afford to minimize costs to its membership. Six representatives would be elected to the executive committee for a 2-year term, with three members being replaced every other year. Employees still paid their fees annually. However, membership would not be compulsory.

Other activities initiated then were adopted as annual events in the years that followed. Some of the more popular ones continue today. These include the spring and fall curling bonspiels where young and old can enjoy three six-end games in an afternoon or evening full of fun. Since 1979, a tug-of-war has been promoted between various groups at the research station. At first, the brawn of the beef-and-swine herders was tested by the biggest and best of the field technicians and farm crew. However, in 1984 and 1985, the contest changed and full-time staff members accepted the challenge by summer students. A trophy is awarded to the victors in the best two-out-of-three pulls. A fishing derby was inaugurated in 1984, and each year brings more stories about "the one that got away." The research station also places an entry into the community slow-pitch softball league each year. The players are mainly summer students, but a few veterans still exercise their prowess on the field. The "B.R.S. (Brandon Research Station) Clubbers" compete against 40-odd teams in Brandon.

The annual social mixer known as the Spring Fling has been held for the past 5 years. This dance gives all permanent, seasonal, and recent employees a chance to renew old acquaintances and make new friends in a more relaxed setting. The picnic at summer's end bids farewell to student workers on their way back to school. Over 100 staff members, retirees, and their families are often in attendance, feasting on barbequed meat, baked potatoes, roast corn, and ice cream. Everyone has a great time watching the races or participating in various games. At Christmas time, there is a children's party complete with Santa's arrival to deliver gifts of fruit and candy. The youngsters sing carols, watch holiday films, and enjoy refreshments. In 1984, a sleigh ride was added to the festivities. For the adults, there is a staff party where past and present employees gather with special guests from the community.

The success of all these activities attests to the high expectations and active involvement of the staff at Brandon. It is hoped that future social clubs will continue to support such worthy traditions.

Employee list

This section lists employees who are now in full-time and seasonal positions or who have worked for at least 2 years at the Brandon Research Station (formerly Brandon Experimental Farm). Records for all employees are not complete (NA, below, means not available). However, every effort has been made to list as many people as possible.

Airey, W.K.; 1973–1978
Al-Molky, K.; 1967–1969
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